AUGUST 1936

MECCANO MAGAZINE

VOL XXI. No. 8.

6D.

HORNBY ELECTRIC & CLOCKWORK TRAINS

Boys, start a railway of your own!

They're just like real trains

You have spent many happy hours watching real trains at work. Now start a railway of your own and enjoy the thrill of operating Engines, Coaches, Wagons, Signals and Points on actual railway principles. It's the most fascinating pastime in the world!

From the day of their introduction Hornby Trains have always represented the latest model railway practice. Designs are continually being improved and new items added so that the system is complete in practically every detail. There are Locomotives for all duties, driven by electric motors or by clockwork. There is Rolling Stock of all kinds including Pullman Cars, ordinary Coaches and Guard's Vans for passenger services, and numerous Wagons and Vans for freight working.

The Accessories are now better than ever before, while with the Rails, Points and Crossings an endless variety of layouts can be constructed, both for Electric and Clockwork Trains.

Ask your dealer for a copy of the latest Hornby Train price list.

PRODUCT of MECCANO LIMITED LIVERPOOL

Prices of Hornby Electric Trains Sets from 15/- to 75/-

Prices of Hornby Clockwork Trains Sets from 4/11 to 65/-

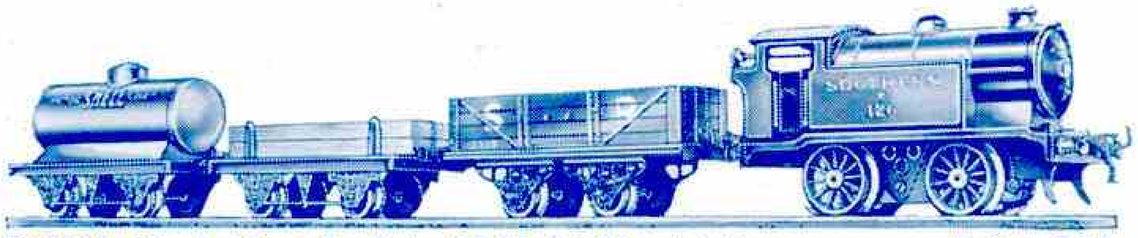
HORNBY LOCOMOTIVES

Electric and Clockwork

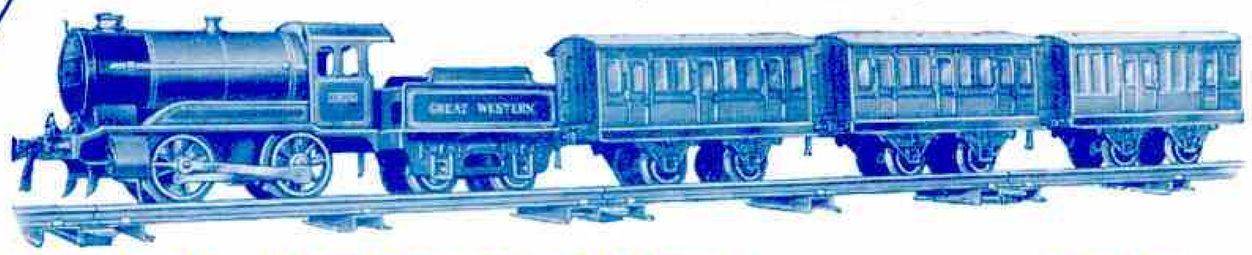
All Hornby Electric Locomotives can be controlled for speed, and for starting and stopping, from the lineside.

Hornby Clockwork Locomotives are the longest-running spring-driven locomotives of their respective types in the world. The motors fitted are perfect pieces of mechanism with accurately cut gears that ensure smooth and steady running.

A SELECTION FROM THE RANGE OF HORNBY ELECTRIC AND CLOCKWORK TRAINS

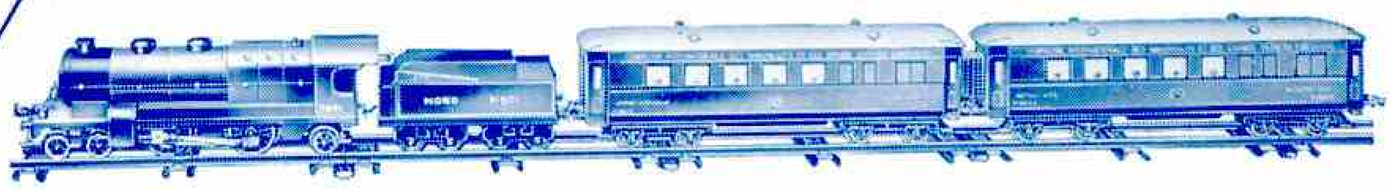


EM320 Tank Goods Set (20-Volt Electric) ... ... Price 24/-

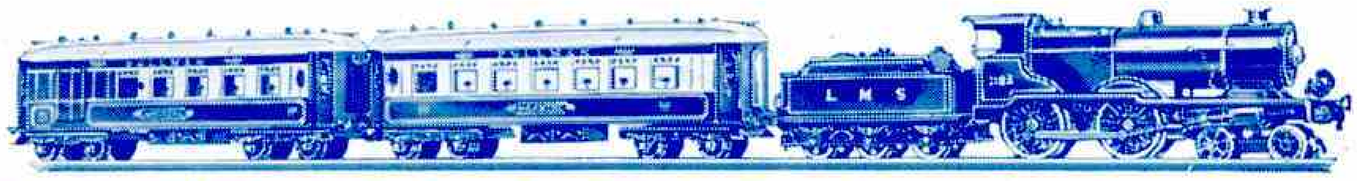


Hornby No. 1 Passenger Set (Clockwork) ... ... Price 25/-

Hornby E220 Mixed Goods Set (20-Volt Electric) ... ... Price 47/6



Hornby No. 3C Riviera "Blue" Passenger Train Set (Clockwork) ... Price 57/6



Hornby E220 Special Pullman Set (20-Volt Electric) ... Price 75/-

MECCANO LTD. BINNS ROAD LIVERPOOL 13

EXTRA SPECIAL EDITION

Popular Toy Display Continues

Hamley's News

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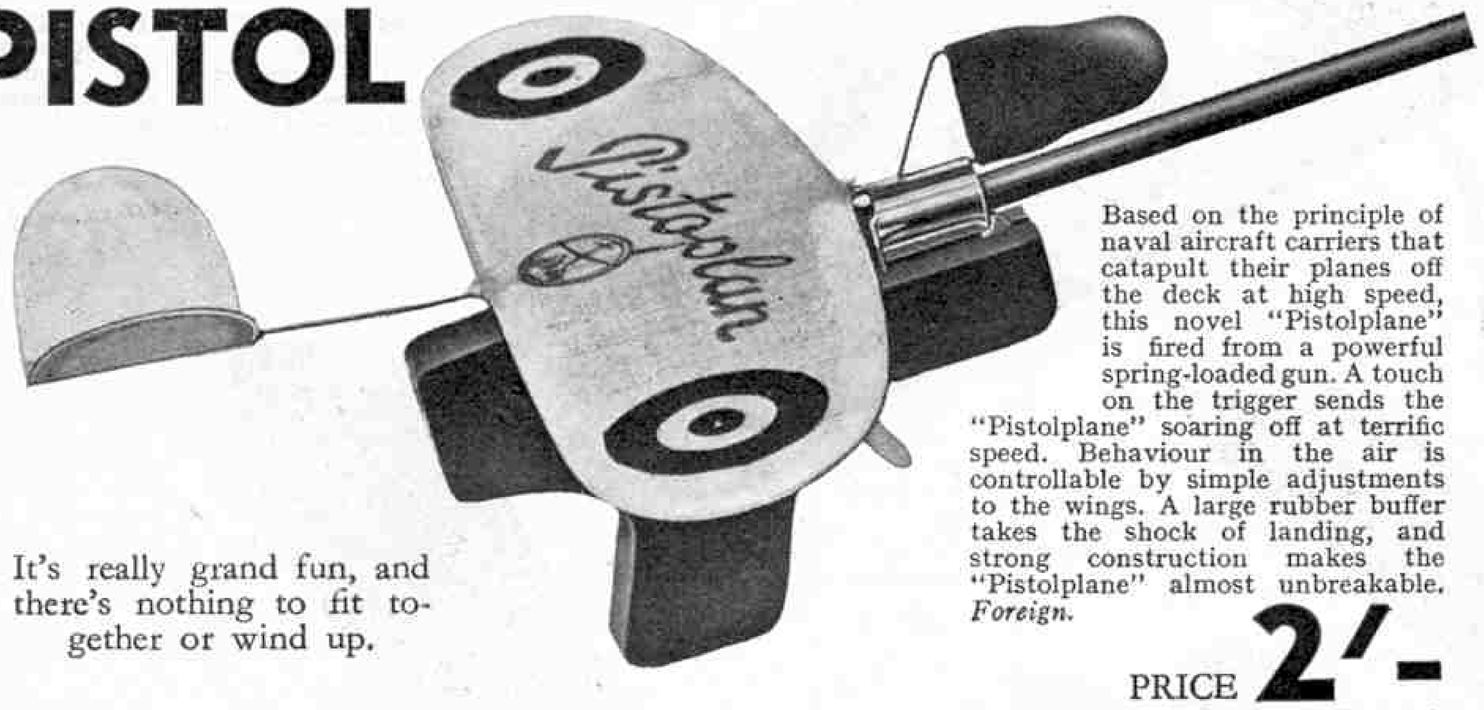
No. 41 *August, 1936*

Novel Planes Speed Boats Cars

PLANE LAUNCHED BY PISTOL

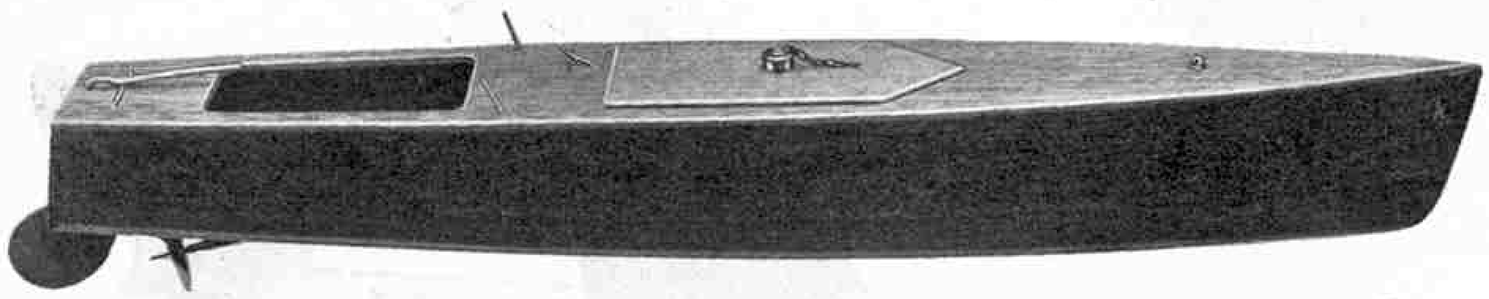


It's really grand fun, and there's nothing to fit together or wind up.

Based on the principle of naval aircraft carriers that catapult their planes off the deck at high speed, this novel "Pistolplane" is fired from a powerful spring-loaded gun. A touch on the trigger sends the "Pistolplane" soaring off at terrific speed. Behaviour in the air is controllable by simple adjustments to the wings. A large rubber buffer takes the shock of landing, and strong construction makes the "Pistolplane" almost unbreakable. *Foreign.*

PRICE **2/-**

Post 3d.



Streamline Boat hits high speed

A powerful long-running motor in the "K" Super Speed Boat is good for high speeds over long distances. Just watch her go! With built-up 24 in. hull of seasoned mahogany, large cockpit, windscreen and adjustable tiller control lever, she's just the boat you want.

PRICE **10/6**

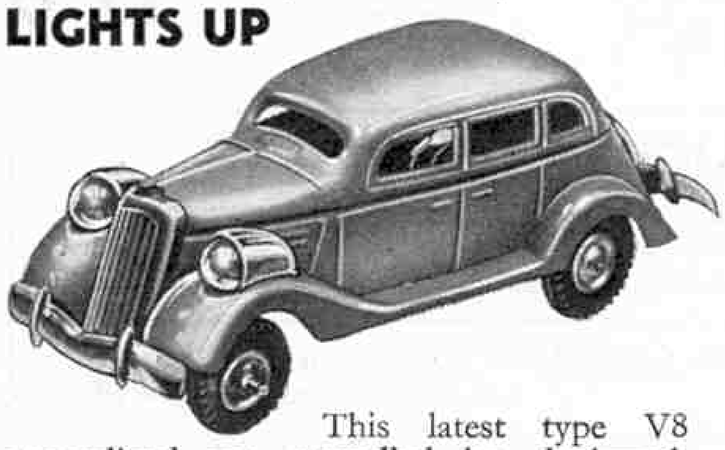
Limited number only. Post 6d.

Power Binoculars give wide vision

With 3x magnification, these powerful binoculars give a wide range of vision and bring distant objects "right into your hand." They're great fun on holidays for spotting ships at sea, or you can steal a march over the other fellows at scouting games by seeing them before they see you. In sturdy black case with long strap for slinging over your shoulder. *Foreign.*

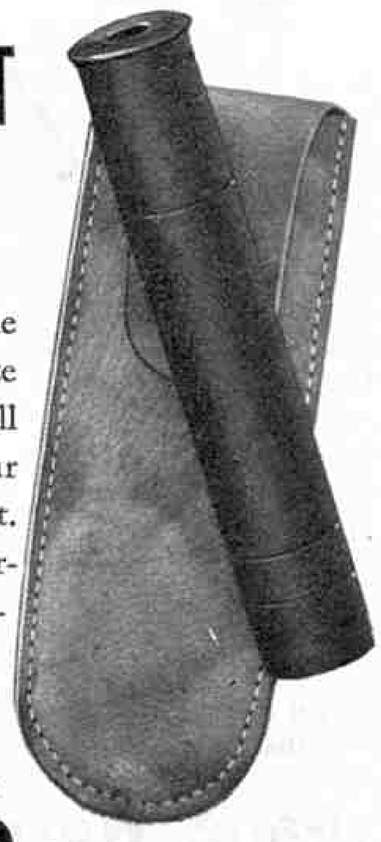
PRICE **5/6** Post 4d.

CAR RUNS, STEERS, LIGHTS UP



This latest type V8 streamlined car, propelled by clockwork motor, runs smoothly on rubber tyres. Front wheels are adjustable to any angle and car will run in circle to save you running after it! Two super head-lamps, powered by electric battery, light up the road ahead. Bumpers back and front. A real motor car. Complete with battery. *Foreign.* PRICE **2/11** Post 3d.

VEST POCKET TELESCOPE



The "Tinytel" has all the advantages of a full-size telescope, yet is so small that it goes into your waistcoat pocket. Handy, compact, powerful. Made of black-enamelled brass, in neat leather case.

PRICE **2/6** Post 2d.

Aeroplane flies by flapping wings

The new Flying-Bird Aeroplane is one of the cleverest inventions from abroad. Based on the same principle as the flight of birds, it flaps its wings and climbs rapidly to a great height. The moving wings are of green oiled silk, and motion is imparted to them through cranks and connecting rods, by a powerful multi-ply rubber cord motor. *Foreign.*

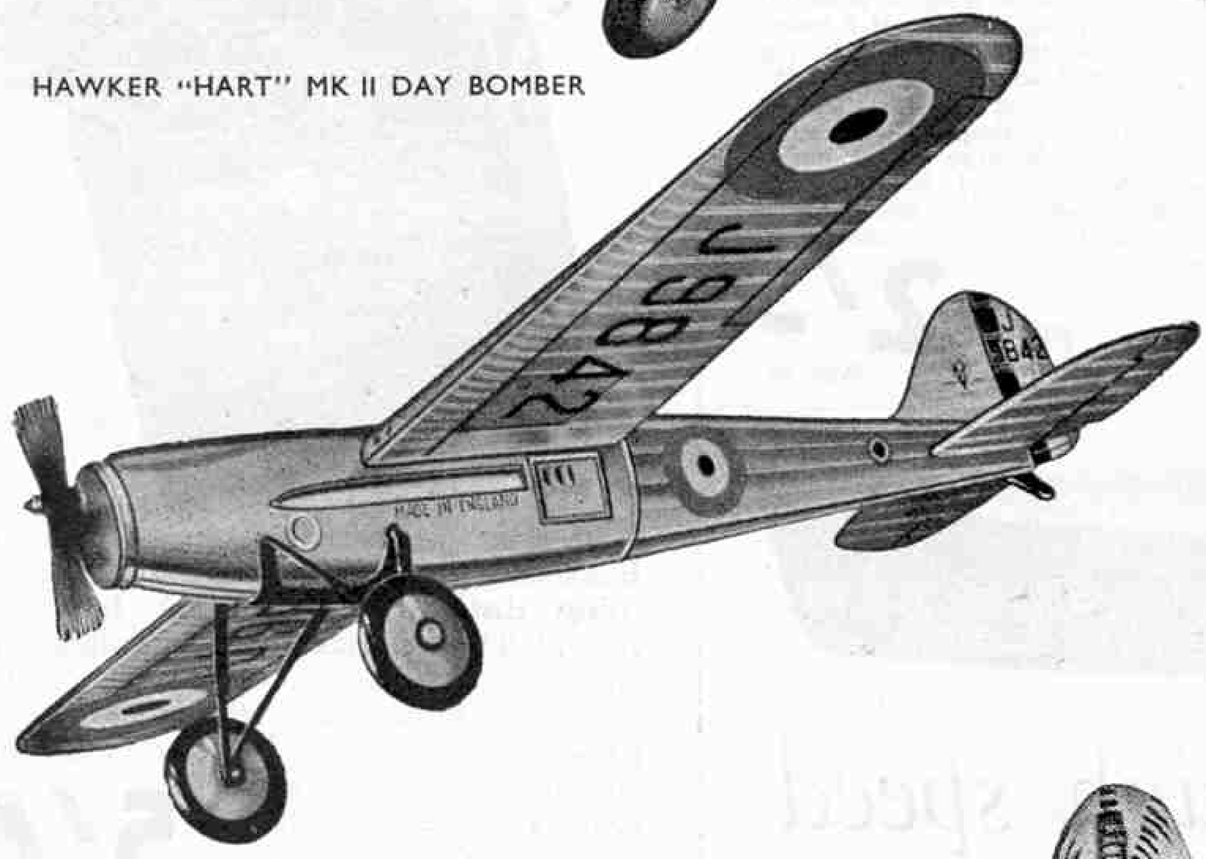
PRICE **2/6** Post 3d.

FLYING SCALE MODEL FROGS

HAWKER "HART" MK II DAY BOMBER

HAWKER "HART" MK II DAY BOMBER

Wing Span—19". Length—15½". A scale model of the world-famous R.A.F. High-Speed Day Bomber. Complete with extra strong **Patent High-Speed Winder-Box,** lubricant for gear box and motors, triple insertor rod, spare motors and profusely illustrated flying manual. **Flies 700 feet,** if handled skilfully. **42/-**



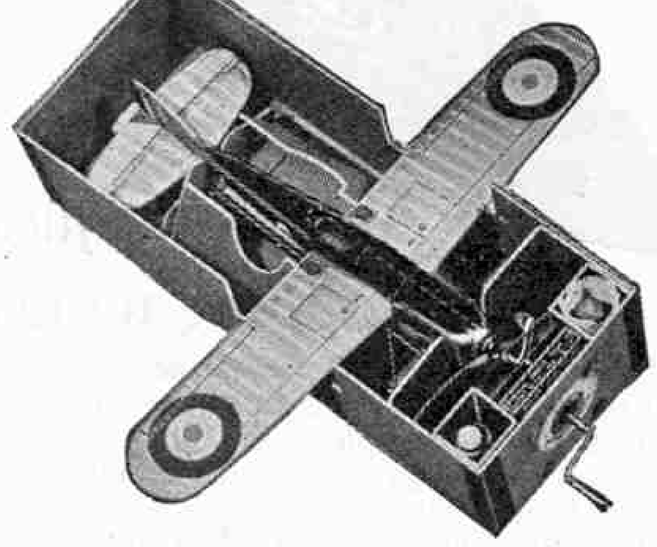
FROG MK IV Interceptor Fighter

The original and now famous flying scale model Interceptor Fighter. Wing Span 11½ ins. Duralumin Fuselage. Complete with Patent High-Speed Winder-Box, Spare Motors, Insertor Rod, Motor Lubricant, Gear-box Oil and fully Illustrated Instruction Manual. With practice it will fly 300 ft.

NOW ONLY **5/-**

FROG PUSS MOTH MONOPLANE

Wing Span—18½". Length—13½". Complete with **Patent High-Speed Winder-Box,** Spare Motors, Dual Insertor Rod, Motor Lubricant, Gear-box Oil and fully illustrated Instruction Manual. Flights of 600 ft. can be obtained under favourable conditions. **17/6**



This illustration shows how quickly the Frog scale models are wound for flight with the geared-up winder-box.
A PATENT AND EXCLUSIVE "FROG" FEATURE.

FREE FLIGHT INSTRUCTION

Lines Bros. will give free flight instruction by appointment on the Frog Aerodrome at Merton. Telephone: Liberty 1041.

COUPON To Lines Bros. Ltd. (Dept. 5), Morden Road, London, S.W.19.

Please send me your **NEW** "Frog" coloured leaflet with particulars of the "Frog" Flying Club and of how to obtain handsome enamelled Air Force pilot Badges.

Name.....

Address.....

Please write in block letters. 8/36

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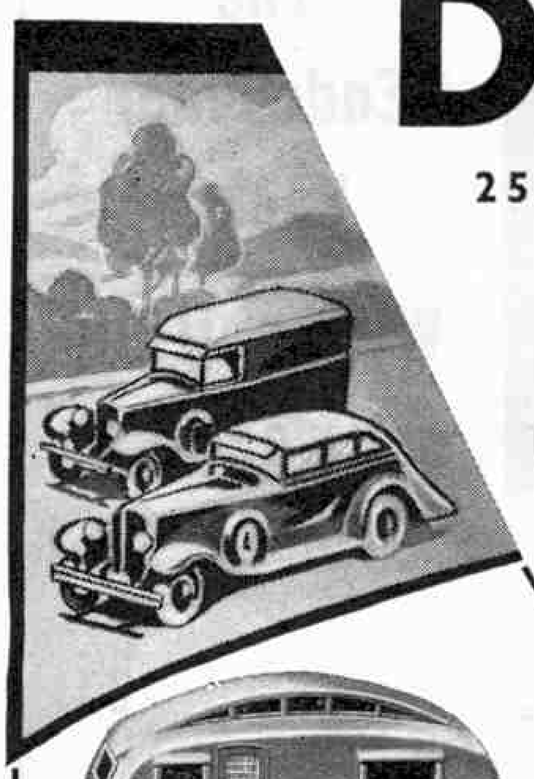
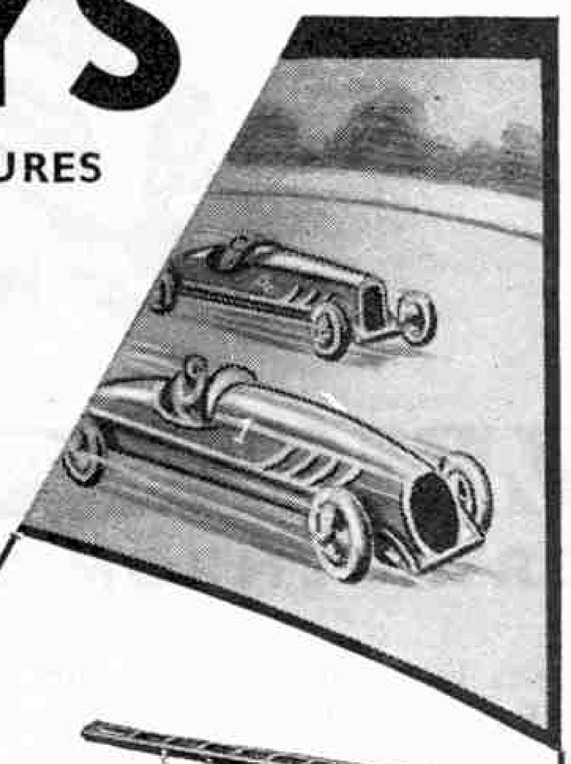
DINKY TOYS

250 VARIETIES

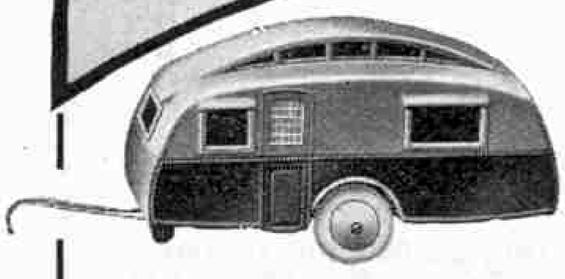
PERFECT MINIATURES





POLICE BOX, MOTOR CYCLE PATROL AND POLICEMEN
Dinky Toys No. 42

No. 42a Police Box ... ... each 6d.
No. 42b Motor Cycle Patrol ... ... each 10d.
No. 42c Point Duty Policeman (in White Coat) ... ... each 3d.
No. 42d Point Duty Policeman ... ... each 4d.
Price of complete set 1/11



CARAVAN TRAILER
Dinky Toys No. 30g
For use with the Saloon Cars in Dinky Toys Nos. 24 and 30. Assorted colours. Fitted with detachable rubber tyres. Price 6d. each

PILLAR LETTER BOX G.P.O.
Dinky Toys No. 12a
Price 3d. each

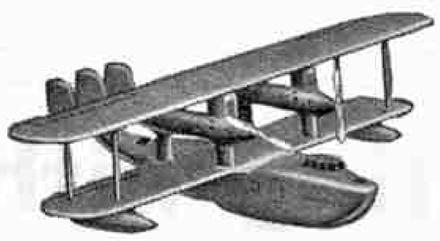
FRENCH LINER "NORMANDIE"
Meccano Dinky Toys No. 52c
A model of the French Line's giant steamship "Normandie." Made in France by Meccano (France) Ltd. Price 1/6 each

STREAMLINE SALOON
Dinky Toys No. 22h
Assorted colours. Fitted with detachable rubber tyres and silver-plated radiator.
Price 6d. each

PILLAR LETTER BOX AIR MAIL
Dinky Toys No 12b
Price 3d. each

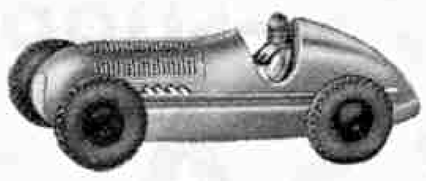
STREAMLINE FIRE ENGINE
Dinky Toys No. 25h
Fitted with detachable rubber tyres. Price 9d. each

D.H. "COMET" AEROPLANE
Dinky Toys No. 60g
Scale model of plane used by C. W. A. Scott and T. C. Black in their Australian flight.
Price 6d. each

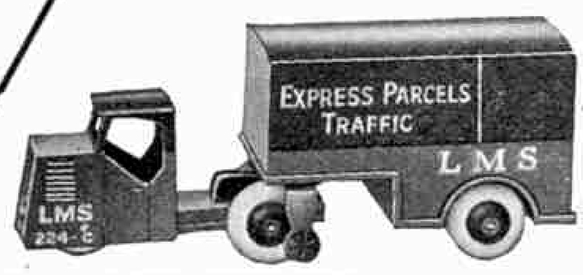


SINGAPORE III FLYING BOAT
Dinky Toys No. 60h
Price 1/– each

FOUR-ENGINED FLYING BOAT
Dinky Toys No. 60m
Similar in type to No. 60h. Assorted colours. Fitted with rollers. Price 1/– each



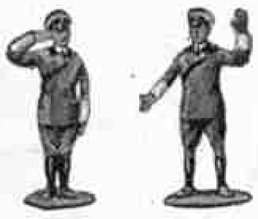
MERCEDES-BENZ RACING CAR
Dinky Toys No. 23c
Assorted colours. Fitted with detachable rubber racing tyres. Price 8d. each



RAILWAY MECHANICAL HORSE AND TRAILER VAN
Dinky Toys No. 33R
Fitted with detachable rubber tyres. Price complete, L.M.S.R., L.N.E.R., G.W.R. or S.R., 1/6

PERCIVAL "GULL" MONOPLANE
Dinky Toys No. 60k
Coloured and lettered to represent the machine in which Mrs. Amy Mollison set up her new England–Cape–England record. Price 6d. each

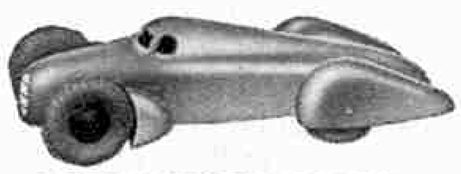
"SILVER JUBILEE" TRAIN SET
Dinky Toys No. 16
A realistic model of the latest type of streamline train, assorted colours. Price 1/6 each.



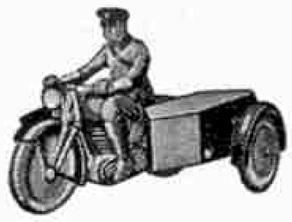
R.A.C. BOX, MOTOR CYCLE PATROL AND GUIDES
Dinky Toys No. 43
This set is representative of the familiar personnel and road box of the R.A.C. Each item is finished in correct colours.

No. 43a R.A.C. Box ... ... each 6d.
No. 43b R.A.C. Motor Cycle Patrol ... ,, 9d.
No. 43c R.A.C. Guide directing traffic ,, 3d.
No. 43d R.A.C. Guide at the salute ... ,, 3d.
Price of complete set 1/9

"SPEED OF THE WIND" RACING CAR
Dinky Toys No. 23e
Assorted colours. Fitted with detachable rubber racing tyres.
Price 8d. each



AUTO-UNION RACING CAR
Dinky Toys No. 23d
Assorted colours. Fitted with detachable rubber racing tyres.
Price 7d. each



A.A. BOX, MOTOR CYCLE PATROL AND GUIDES
Dinky Toys No. 44
Collectors of Dinky Toys will find this new addition to the range of particular interest. Each item is finished in correct colours.

No. 44a A.A. Box ... ... each 8d.
No. 44b A.A. Motor Cycle Patrol ... ,, 9d.
No. 44c A.A. Guide directing traffic ... ,, 3d.
No. 44d A.A. Guide at the salute ... ,, 3d.
Price of complete set 1/11

SMALL CARS
Dinky Toys No. 35

No. 35a Saloon Car ... ... each 3d.
No. 35b Racer ... ... ,, 3d.
No. 35c "M.G." Sports Car ... ... ,, 3d.
Price of complete set 9d.

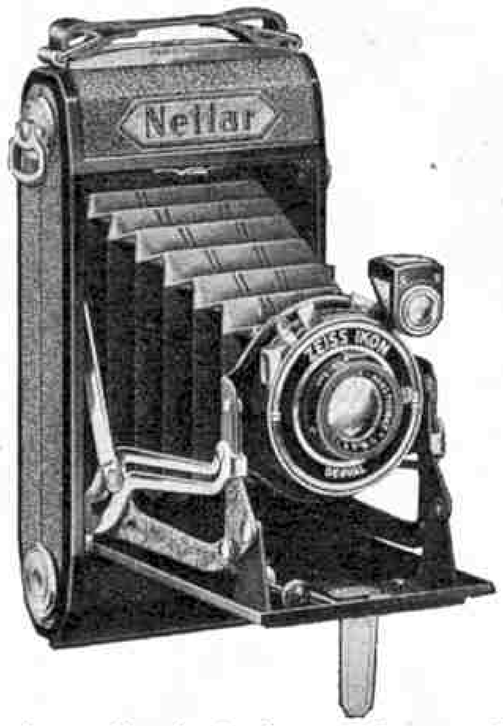
MECCANO LTD. : : BINNS ROAD : : LIVERPOOL 13

for any Camera...

ZEISS IKON FILM
ORTHOCHROM OR PANCHROM

Zeiss Ikon film will get the best out of your camera. It is fast, will add hours to the working day of your camera. Zeiss Ikon film is fine grained, essential for making really big enlargements from small negatives, and has great latitude, makes allowance for and corrects every little mistake in exposure.

for any film...



NETTAR

ZEISS IKON

A really high-class 100% self-erecting camera is the Nettar. The special two-point setting of focus and stop simplifies matters for the snapshotter, and makes the Nettar as simply operated and with as little experience as a box camera, whilst also providing the movements—iris diaphragm, range of shutter speeds, focussing arrangement necessary for more advanced work. Uses 3¼″ x 2¼″ roll films. Prices from £3 15 0

Zeiss Ikon products are stocked by most up-to-date dealers. New Zeiss Ikon publication "The Path to Trouble Free Photography," will help you to make your holiday snaps 100% more successful. Write for your free copy to-day.

ZEISS IKON LTD., 46, Mortimer House, Mortimer Street, London, W.1.

BOTH for PERFECT PHOTOGRAPHY

BOND'S

The 'Endeavour' Yacht.

Will sail in any weather.

These new Yachts are the latest thing for fast racing work. All of the hulls are hand made in best yellow pine. The two largest Yachts are fitted with Braine type automatic steering. Painted Pale Blue. Cabin Skylight extra.

Prices:

17 in. Yacht with automatic rudder	11/–
21 in. Yacht with automatic rudder	17/6
27 in. Yacht with Braine type steering	37/6
36 in. Yacht with Braine type steering	69/–

Carriage extra.

SAILCLOTH.

This Super Sailcloth is made from the finest **Union Silk** and is very light, extra strong. **2/3** yard, 42 in. wide. Plus Postage.

Send for Bond's 1936 Catalogue, it has 180 pages filled with all types of Locomotives, Boats, Aeroplanes, Tools and Materials. Price **6d.** post free.

BOND'S O'EUSTON ROAD LTD.,
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'Phone: Museum 7137. Est. 1887.

French Agents: Messrs. J. Fournereau, 60, Rue Alphonse-Pallu, Le Vesinet (S-&-O.)

S. Africa Agents: Messrs. J. Alcock & Co., 69, Mooi Street, Johannesburg.

Boys—shooting with a B.S.A. Air Rifle is great sport!

Use a B.S.A. Air Rifle and learn to become a first-class marksman able to score a "possible" on the target or kill rats and other garden pests with ease.

B.S.A. Air Rifles have barrels bored and rifled to very close limits and are sufficiently powerful to kill up to 30 yards range (.22 model 50 yards).

For indoor shooting B.S.A. Air Rifles are quite safe if used with a B.S.A. Target Holder, and the only ammunition required is B.S.A. Lead Pellets which cost 2/3 per thousand—37 accurate shots for one penny.

See your local dealer to-day and inspect a B.S.A. Air Rifle, or post the coupon below for full details.

No license is necessary for anyone to use a B.S.A. Air Rifle in the house but the purchase must be made by someone over 17 years of age.

Prices from

45/-

or only

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a month

B.S.A. GUNS LTD., 92, Armoury Road, Birmingham, 11.

Air Rifle Leaflet, Please.

Name .....

Address.....

FROG MODEL AIRCRAFT

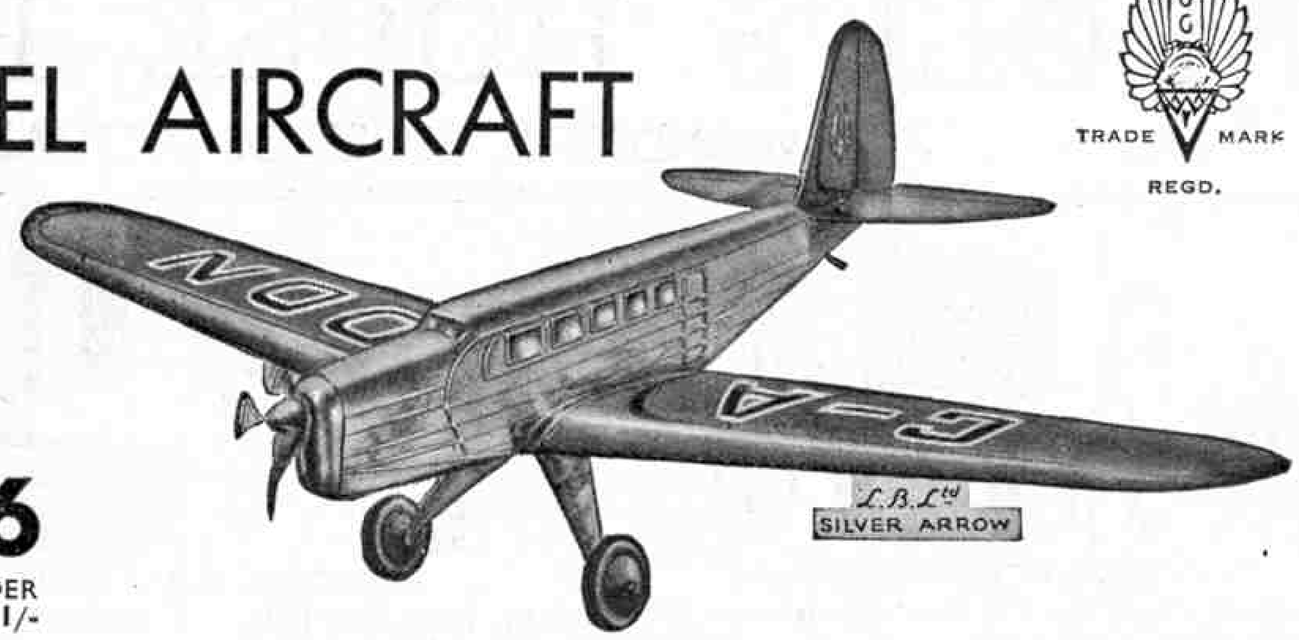
FROG TRADE MARK REGD.

"SILVER ARROW"

THE LATEST—AN INEXPENSIVE FLYING MODEL AIR LINER

Non Scale low wing Monoplane: Single engine Air Liner. Aluminium Fuselage: Detachable Propeller and Nose Piece: Accurate pitch Propeller: Adjustable Controls: Transparent Windows: Wing Span 16½ ins.: Flies 100—120 feet: Spare Motor and Insertor Rod: Double surface detachable Wings. Better results are obtained by using FROG elastic lubricant, price 2d. per bottle.

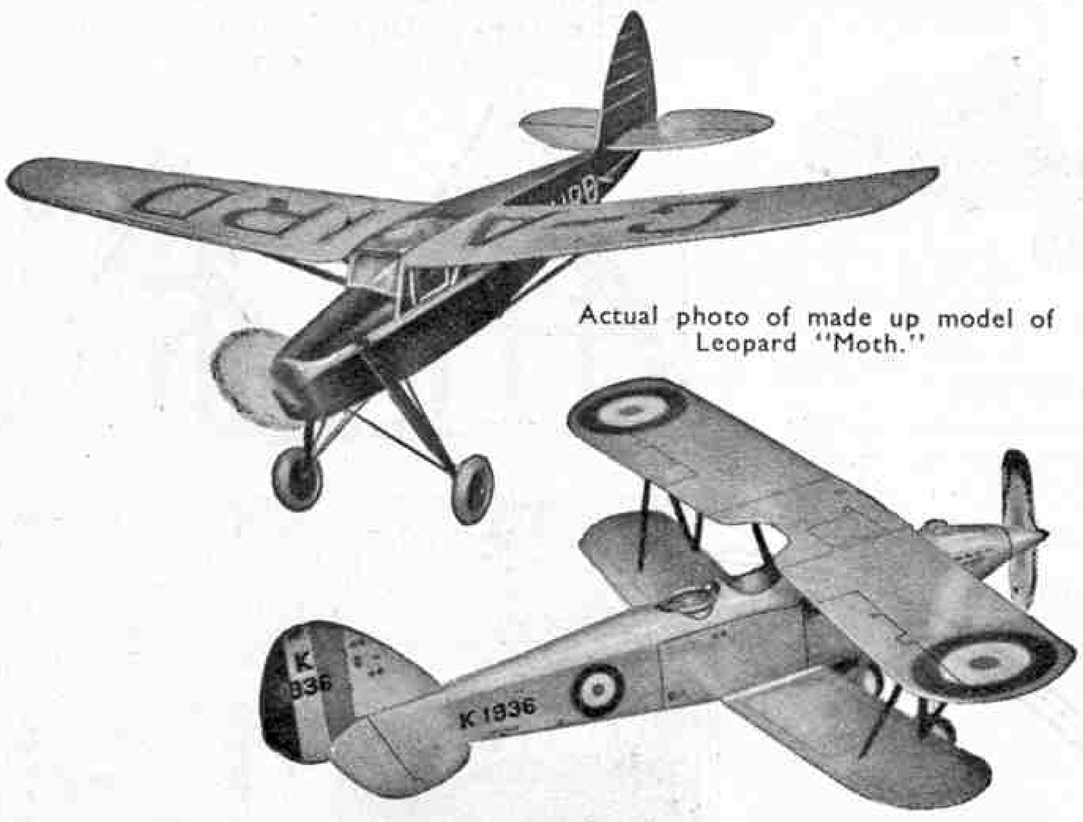
2/6



ASK YOUR DEALER TO SHOW YOU THE GEARED UP HAND WINDER SPECIALLY DESIGNED FOR THE "SILVER ARROW." Price 1/-

3 NEW CONSTRUCTION KITS

FOR BUILDING FLYING SCALE MODELS



Actual photo of made up model of Leopard "Moth."

Actual photo of made up model of Hawker "Demon."

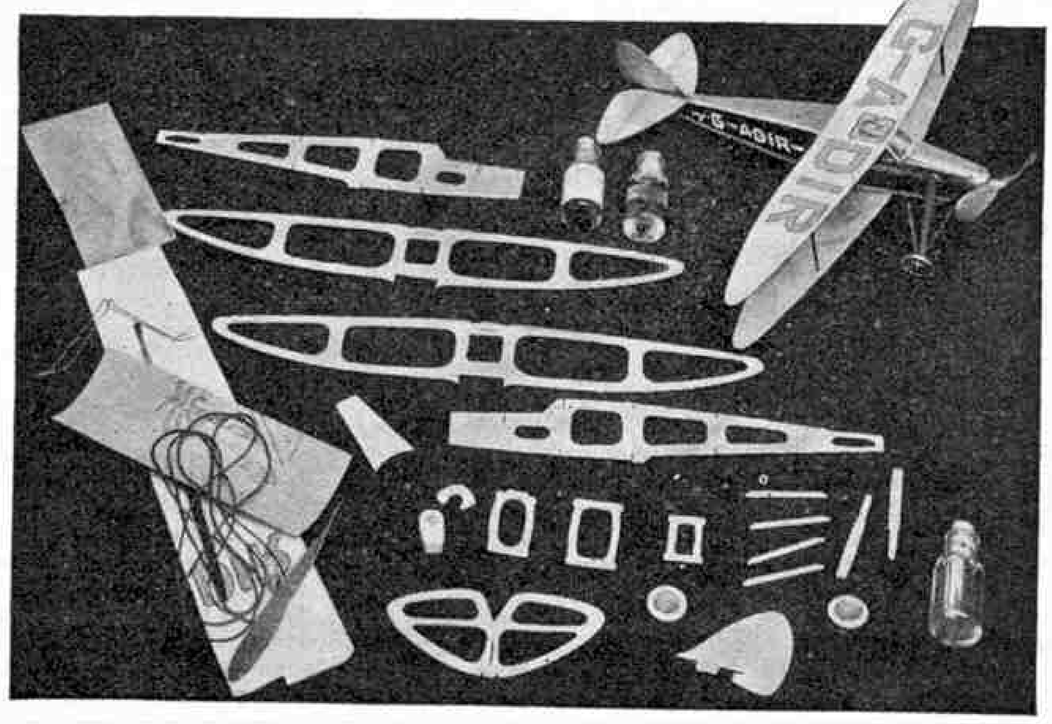


Photo of completed De Havilland "Hornet Moth"; also construction kit.

These construction kits enable the enthusiast to build his own Flying Scale Models. They are easy to build and no tools are required. All parts are blanked out and fit together perfectly, only needing to be glued. (This is supplied.) Wire parts are already bent to shape. No paint is required, all coverings are printed in the correct colours. Supplied complete with motor lubricant and spare motor.

NO TOOLS REQUIRED—ALL PARTS CUT TO SHAPE

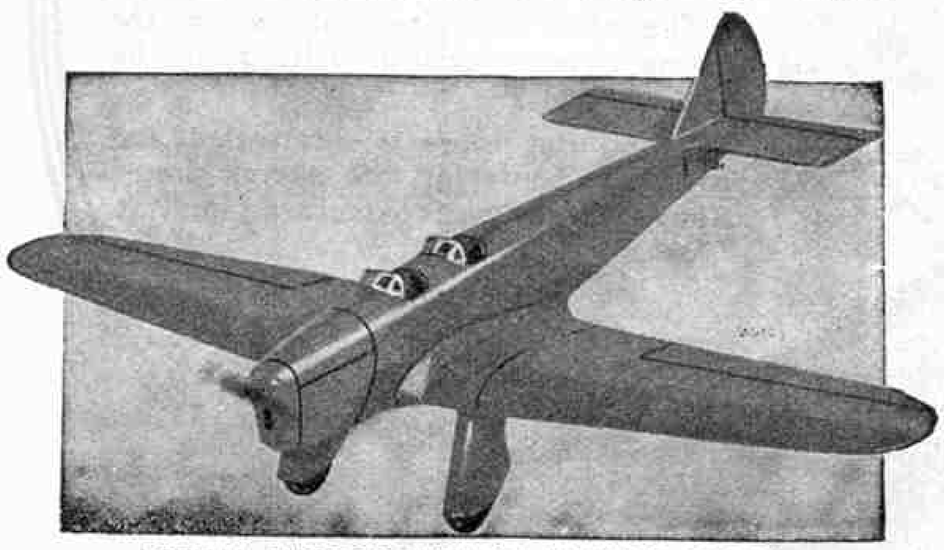
De Havilland "LEOPARD MOTH" Wing Span 12¼ ins. Length 9½ ins. **2/6**

Hawker "DEMON" 2-seater Fighter Wing Span 12¼ ins. Length 11 ins. **4/6**

De Havilland "HORNET MOTH" (Illustrated.) Wing Span 11 ins. Length 9½ ins. **3/6**

AND FOR THE MORE EXPERIENCED MODEL BUILDER THERE IS THE

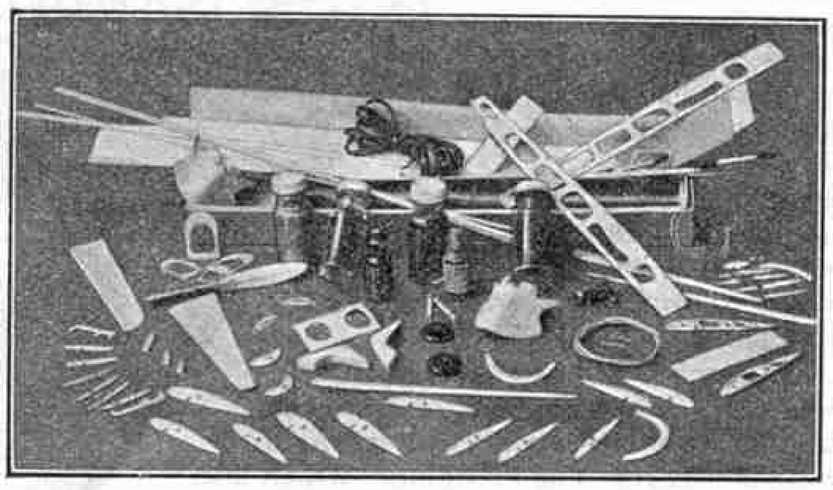
MILES "HAWK MAJOR"



ACTUAL PHOTOGRAPH OF FINISHED MODEL

Scale model of record-breaking light aeroplane

ALL IMPORTANT PARTS CUT TO SHAPE. FINISHED AIRSCREW AND STEP UP GEAR BOX



WITH MILES "HAWK MAJOR" CONSTRUCTION

An easily assembled kit for constructing a flying scale model of this famous record breaking light Aeroplane SUPPLIED WITH ALL IMPORTANT PARTS BLANKED OUT. Full instructions with step by step instruction sheet. Finished airscrew and step up gear box, aluminium wheels and windshields. Wing span 16½ ins. With a little experience flights of 600 ft. are obtainable. **10/6**

Fill up coupon on page ii for new illustrated leaflet in colour, showing FROG range of Model Aircraft.

Designed and made by The International Model Aircraft Ltd.

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Dinky Toys

DOLL'S HOUSE FURNITURE

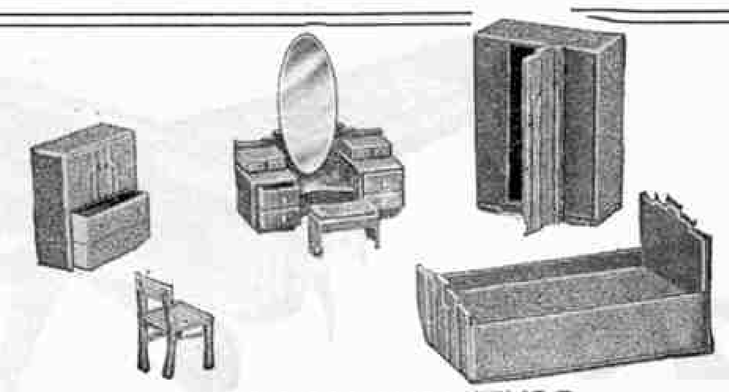
A WONDERFUL SERIES OF ACTUAL SCALE MODELS

DINING-ROOM FURNITURE

Dinky Toys No. 101 Price of complete set 2/3

No. 101a.	Table	5d. each
No. 101b.	Sideboard (Opening doors)	9d. ,,
No. 101c.	Carver Chairs	3d. ,,
No. 101d.	Chairs	2d. ,,

Supplied in walnut finish only.



BEDROOM FURNITURE

Dinky Toys No. 102 Price of complete set 2/11

No. 102a.	Bed	6d. each
No. 102b.	Wardrobe (Opening door) ...	9d. ,,
No. 102c.	Dressing Table (Opening drawers)	10d. ,,
No. 102d.	Dressing Chest (Opening drawers)	6d. ,,
No. 102e.	Dressing Table Stool	2d. ,,
No. 102f.	Chair	2d. ,,

Supplied in colour or walnut brown finish.

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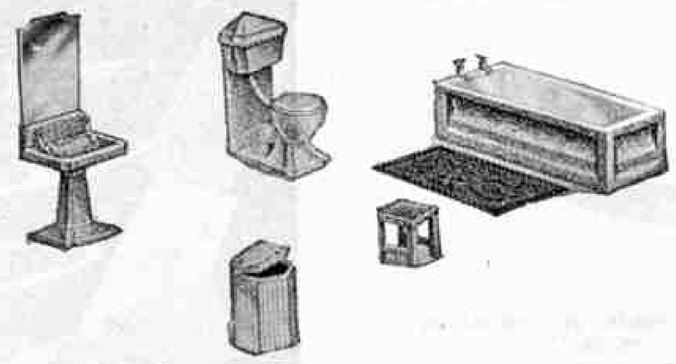
Dinky Toys No. 103 Price of complete set 2/6

No. 103a.	Refrigerator (Opening Door)	8d. each
No. 103b.	Kitchen Cabinet (Opening doors and drawer) ...	10d. ,,
No. 103c.	Electric Cooker (Opening door)	6d. ,,
No. 103d.	Table	4d. ,,
No. 103e.	Chair	2d. ,,

Supplied in two colour schemes—light blue and white; light green and cream.



BATHROOM FURNITURE

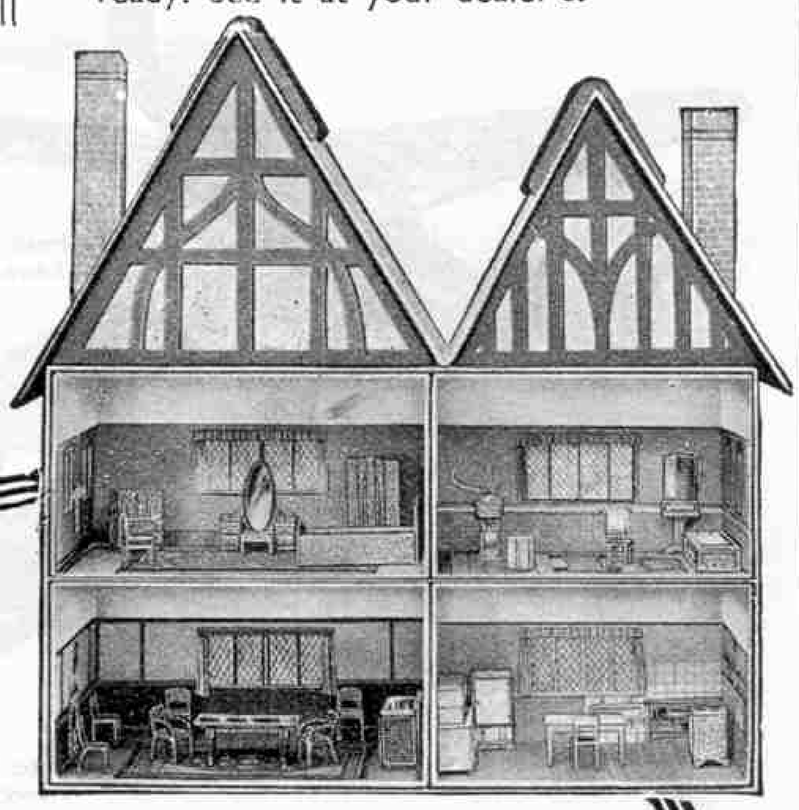
Dinky Toys No. 104 Price of complete set 2/-

No. 104a.	Bath 6d. each	No. 104b.	Bath Mat 1d. each
No. 104c.	Pedestal Hand Basin	6d. ,,	
No. 104d.	Stool	2d. ,,	
No. 104e.	Linen Basket (Opening lid) ...	4d. each	
No. 104f.	Toilet (Lifting lid)	6d. each	

Supplied in two colour schemes—pink and white; light green and white.

The extension of the range of Dinky Toys to include true-to-scale modern Furniture will be welcomed by all who know the charm of these perfect miniatures. Much care and thought have been given to the design, finish and presentation of every article of this Furniture series. Each piece is based on a typical example of modern design, and **all are actual scale models made to a scale of 7/16th of an inch to one foot.** There is a tone and individuality of style about Dinky Toys Doll's House Furniture which cannot fail to appeal. Among the most attractive features are the opening doors and drawers. This furniture is far superior to anything of its kind that has ever before been produced for the delight and pleasure of young people.

The Dinky Toys Furniture is now ready. See it at your dealer's.



This back view of the Doll's House shows the four suites of Dinky Toys Doll's House Furniture tastefully arranged in position.

"DOLLY VARDEN" DOLL'S HOUSE

THE LATEST FROM MECCANOLAND

The "Dolly Varden" Doll's House illustrated here has been specially designed for use with Dinky Toys Doll's House Furniture.

The house is collapsible and the exterior is designed to represent a half-timbered dwelling, while the interior decorations, which are printed in nine colours, are in an attractive modern style.

Reinforced leather board is the material of which the house is constructed, and when set up it is as strong as a wood structure. The container, which also is made of reinforced leather board, opens out to show a lovely garden with Tennis Lawn, Carriage Drive, and Rockery, providing an exquisite setting for play with Dinky Toys and Hornby Trees, Hedging, etc. Price 9/6

DIMENSIONS

The following are the overall dimensions of the "Dolly Varden" Doll's House when built up ready for play. Length, 1 ft. 6¾ in. Depth, 10¼ in. Height, 1 ft. 6¾ in.

The open container on which the house stands measures 3 ft. 3½ in. by 2 ft. 5½ in.

When the house is dismantled and packed in container, the overall dimensions of the complete parcel are ¾ in. x 1 ft. 7½ in. x 2 ft. 5½ in.

The Couch Hammock, Tennis Net, Garden Seats, Dinky Toys Garage, Motor Cars and Figures, and the Hornby Trees and Hedging featured in the illustration on the left are not included with the Doll's House and Garden.

MECCANO LTD. - BINNS ROAD - LIVERPOOL 13

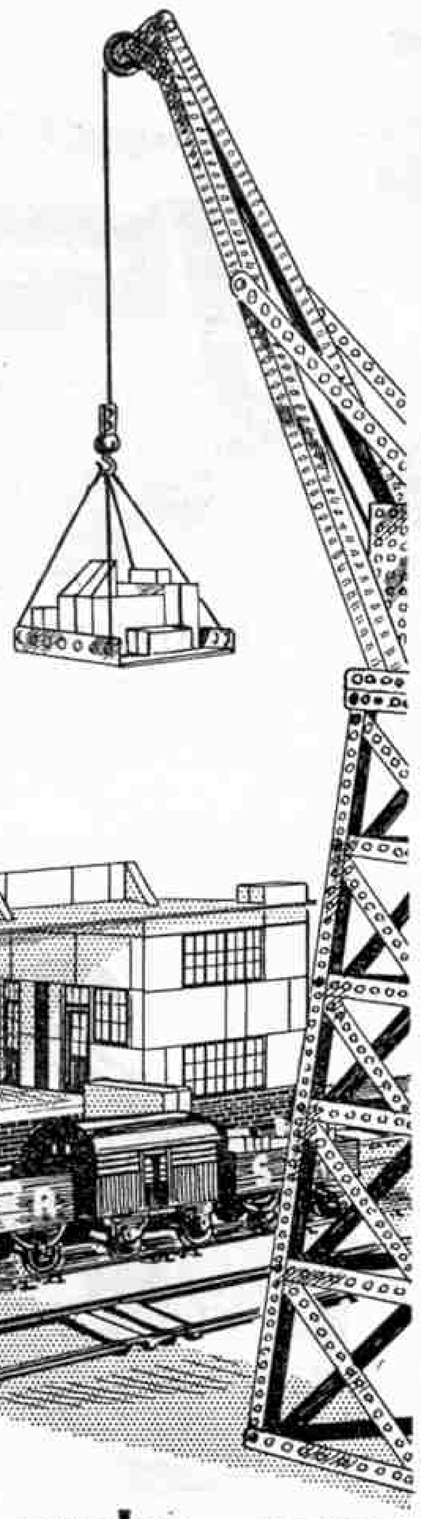
Reconstruction of Main Line Station

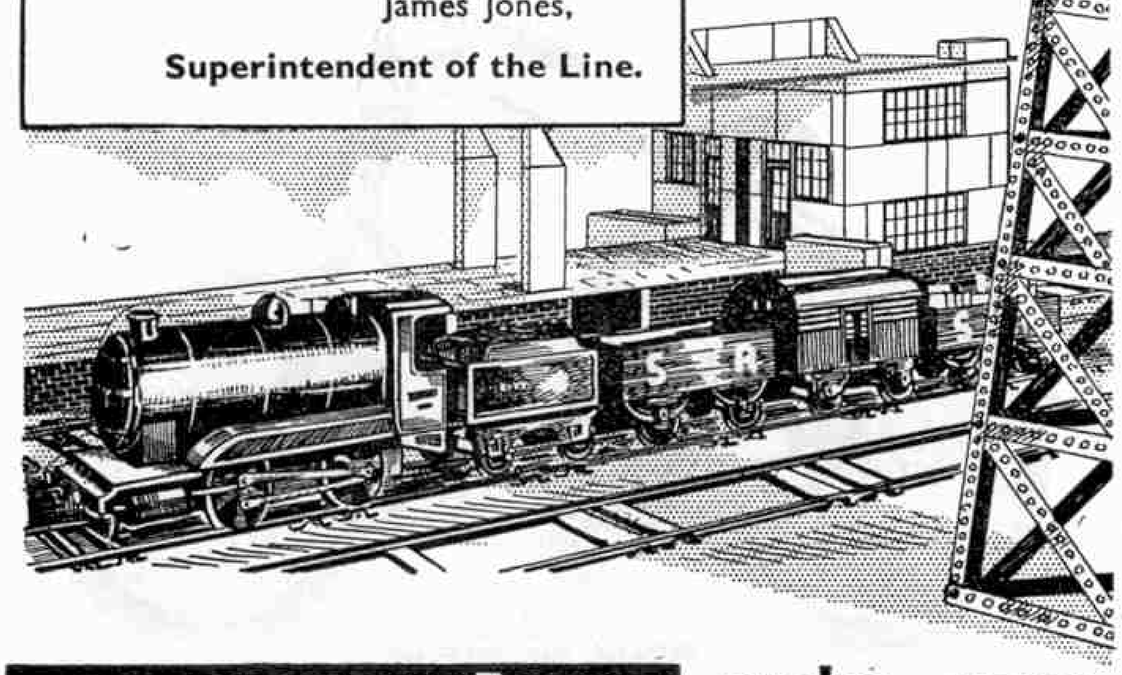
Single line working will operate on the up line. Traffic for Kitchen will be diverted via Hall Junction. A shuttle service will operate between Hat-Rack and Hall Mat Halt. **All construction to be carried out in Lott's Bricks.**

By order,

James Jones,

Superintendent of the Line.





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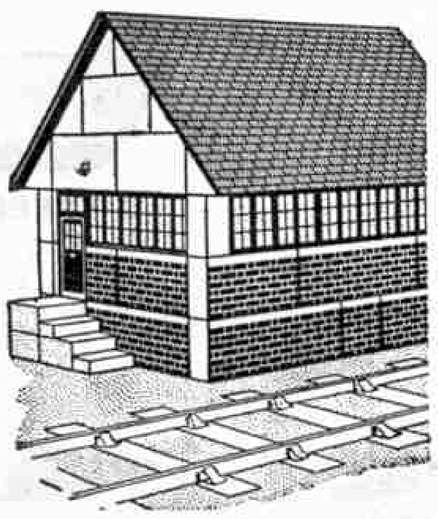
Build your own stations, stone bridges, signal boxes and other railway buildings with Lott's Bricks. As they are stone, they build up firm and solid, and what a splendid load they make for a crane to transfer to your goods trucks!

Lott's Bricks **2/–** to **35/–**. Lodomo (with windows and doors) **3/6** to **12/6**. Tudor Blocks (for half-timbered buildings) **3/6** to **35/–**.



A signal cabin built from Lodomo, Box 3.

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a laboratory in your home

Real apparatus and chemicals the same as those in the school laboratory—and you can spend all the time you like on the experiments that interest you! Each set contains a book of instructions by a Doctor of Science explaining all the experiments and reactions.

Prices **3/6, 6/–, 10/6** to **42/–**. Large cabinets from **£3.3s.** to **£5.5s.** Send for free illustrated list of all Lott's products (1d. stamp on P.C. or 1½d. stamp on letter, please) from Dept. M.M.

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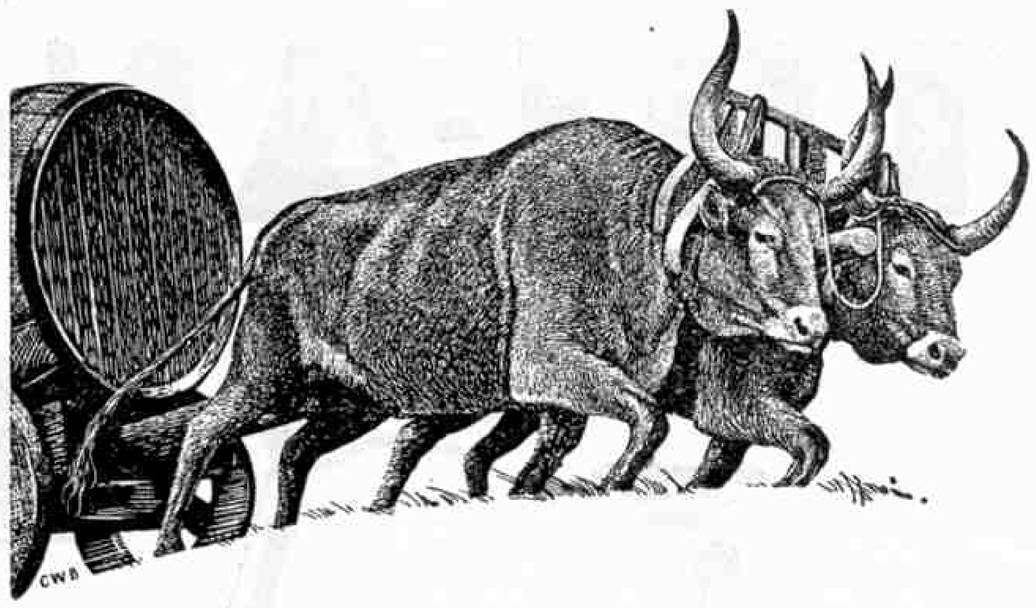

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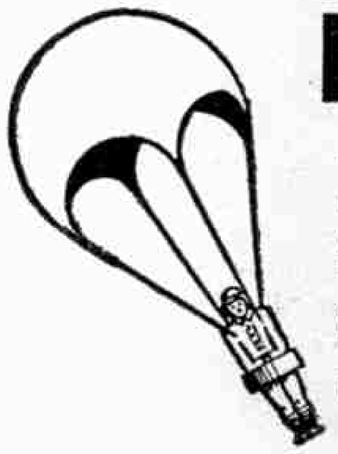

The truly amazing long distance flights so easily obtainable with Warneford Models has made them famous throughout the World.

There is a fine range of models from 1/6 to 5 guineas with flights ranging from 500 to 2,500 ft. The "Moth" at 3/6, and "Demon" at 7/6 (a particularly good flyer) are typical examples of this fine range. *The price list, post free on application to the address below, contains a full description of them all.*

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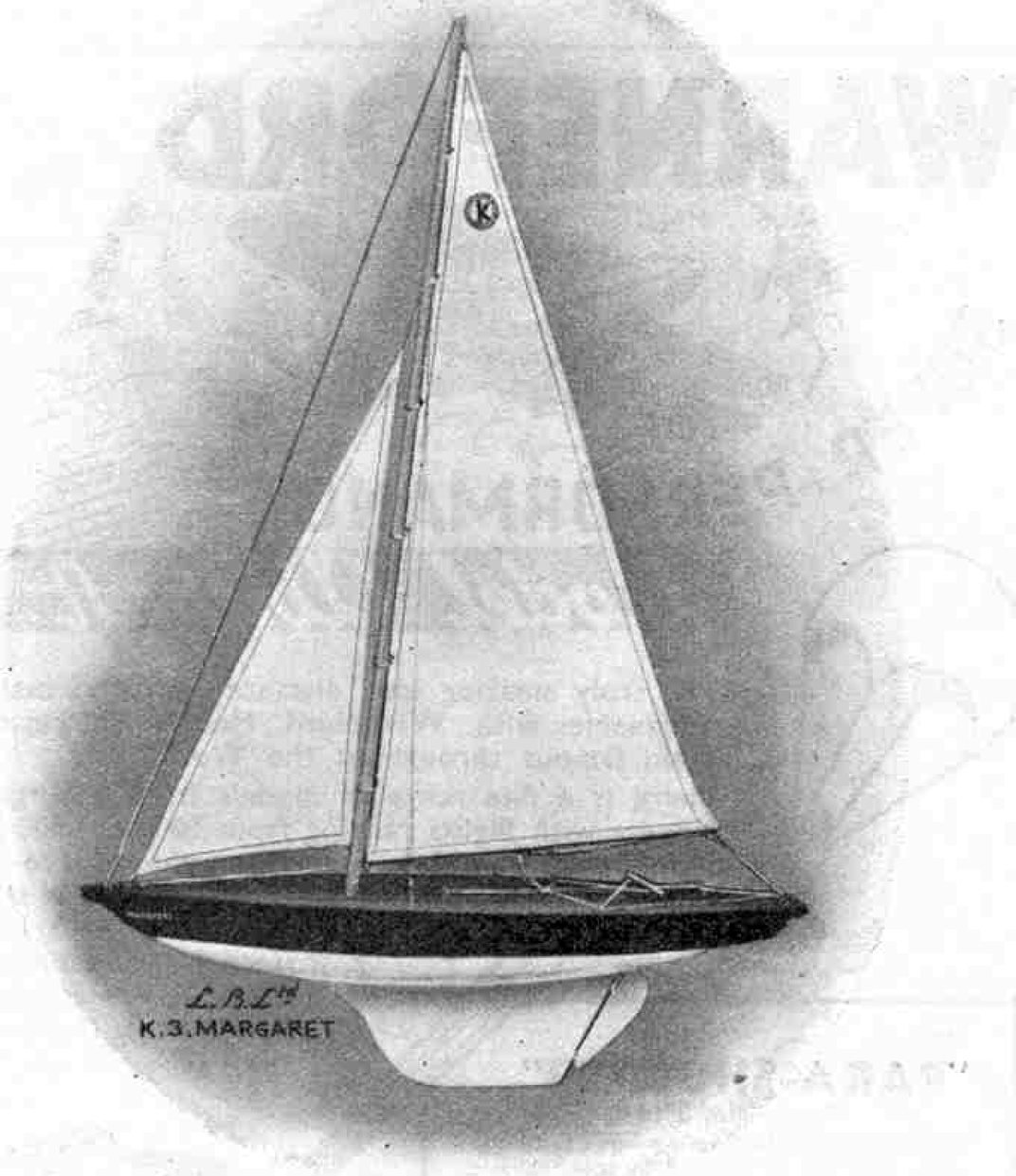
REGD. TRADE MARK

TRI-ANG "FAIRYCYCLE" (Regd.) MODEL No. 2

Tubular frame. 14 in. wheels. 1⅛ in. grey imitation pneumatic tyres. Ball-bearing pedals. Rim brake. Two coil saddle. Chain cover. Stand. CHROMIUM-PLATED FITTINGS. Black, blue or maroon.

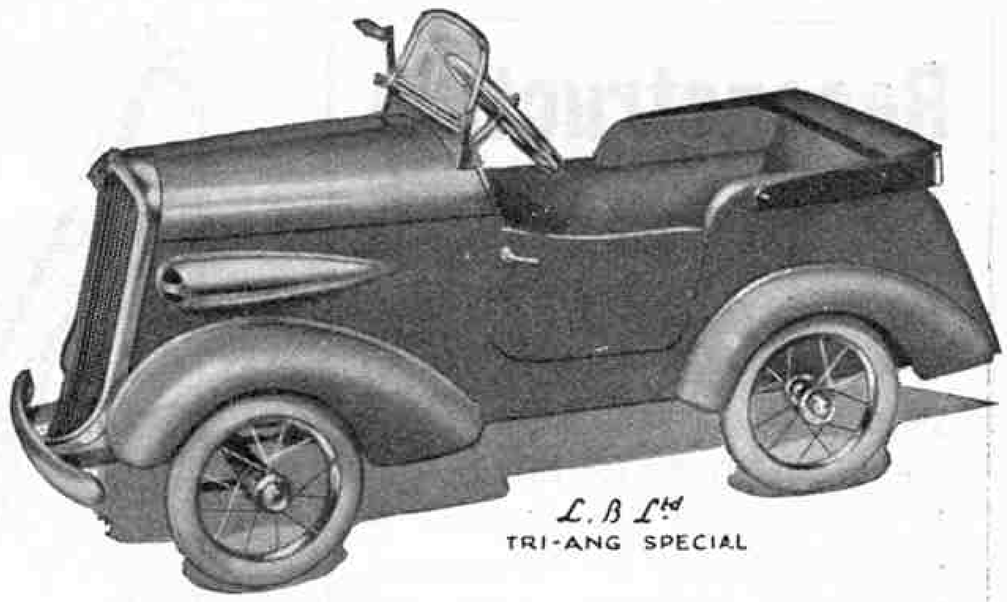
RETAIL PRICE **39/6**



K YACHT "MARGARET"

Magnificent craft with AUTOMATIC STEERING. Patent light-weight weather resisting hull. Solid mahogany polished deck. Mast and boom made from finest selected material, best quality sails, fully adjustable. Beautifully finished in Blue and White. Length of hull 26 in. **22/6**

OTHER MODELS **15/-, 32/6**



TRI-ANG SPECIAL

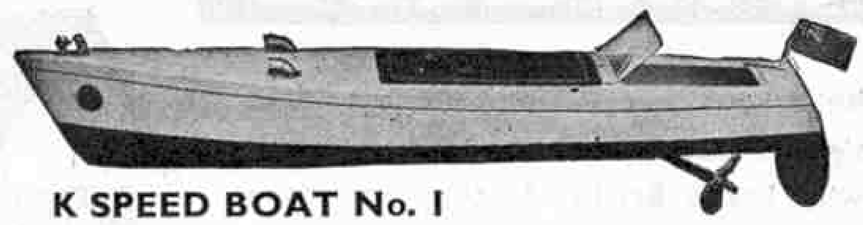
Entirely new Streamline model. Steel body with opening side door and luggage boot. Tangent spoke wheels, 1 in. cushion tyres. CHROMIUM-PLATED bumper, rims and streamline dummy side lamps. Windscreen, direction indicator and dummy hood. Length 41 ins.

RETAIL PRICE **42/-**

TRI-ANG TRICYCLE No. 5 (Regd. Trade Mark)

FITTED WITH REAR MUDGUARDS. Cycle chain drive with free-wheel. Frame best quality weldless cycle tubing, 14 in. wheels. 1¾ in. jointless sponge-rubber tyres. Rim brake. Coil-spring saddle. CHROMIUM FITTINGS. Black, blue or maroon.

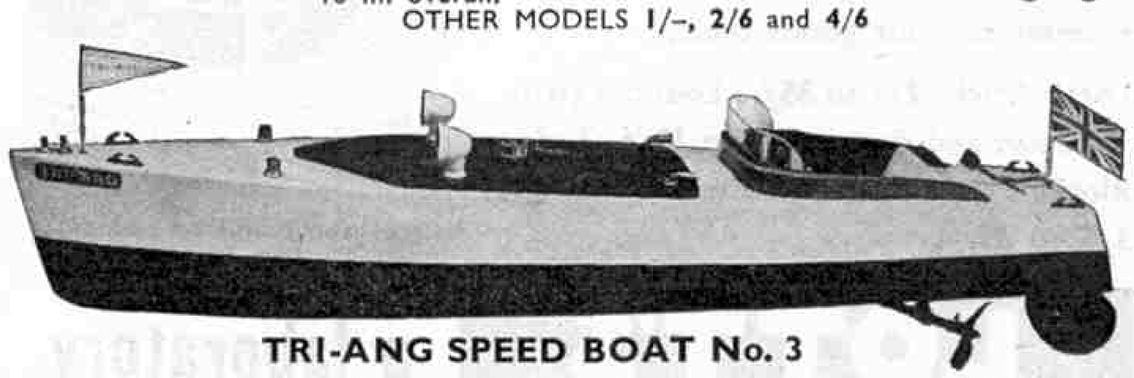
RETAIL PRICE **59/6**



K SPEED BOAT No. 1

Fitted with powerful mechanism, windscreen, dummy ventilators, control lever and adjustable rudder. Hull 16 in. overall. **6/6**

OTHER MODELS **1/–, 2/6** and **4/6**



TRI-ANG SPEED BOAT No. 3

Specially designed hull with mahogany deck, brass fittings, ventilators and detachable motor cover. Very powerful clockwork mechanism. Complete with bow pennant and stern flag. Hull 20½ in. overall. **21/-**

ALSO SUPPLIED WITH ELECTRIC MOTOR **25/–**

OTHER MODELS **10/6, 29/6, 35/–, 39/6**

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NEXT MONTH: "HOW AUTOMATIC FIRE ALARMS WORK." PUBLISHING DATE: 1st SEPTEMBER

MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXI. No. 8
August, 1936

With the Editor

Holidays and the "Silly Season"

By the time this issue of the "*M.M.*" reaches its readers, most of them will be on holiday, out in the open enjoying the sunshine. I ought perhaps to qualify this by adding "if the sun really is shining," for I am writing at a time when day after day, including the ill-omened 15th July, St. Swithin's day, seems to bring with it an undue share of rain. This may be gratifying to the water engineer, who no doubt chuckles as he watches his reservoirs filling; but it is scarcely what the holiday-maker wants. Whether the sun shines or not, however, holidays are holidays.

August is the time when the sea-serpent also takes a holiday, or at least ventures from the secret haunts in which he lurks during the greater part of the year. That is the only explanation I can find for the regularity with which stories of his appearance crop up during this month, in what is known as the "silly season." I hope that any amateur photographers among my readers who are fortunate enough to meet the sea-serpent will not be paralysed with excitement, as was the only man known to have had a camera with him when the creature showed himself. I should like to publish genuine photographs of the sea-serpent, so here is a chance for readers to enable their favourite Magazine to make what in newspaper circles is called a "scoop." They need not be deterred by fear of inclusion among the "credulous sailors, imaginative landsmen, and common liars" who, according to a well-known dictionary, have seen this elusive marine monster, for such a photograph would be good evidence that it really exists.

The Sligo Monster

A few days ago I read of the appearance at Sligo, on the west coast of Ireland, of a strange creature 51 ft. in length with a great elephantine head. Its lower jaw was armed with 44 teeth that rather surprisingly were described as resembling tennis balls, which does not suggest ferocity. I gather that the unfortunate creature was harmless, and probably, like the sea-serpent, it was merely out on a holiday tour when it came to an untimely end. A short time previously the "*Queen Mary*" had rammed what was believed to be a whale, and the presence of an enormous gash in the side of the Sligo monster has led some people to suggest a connection between the two events. If so, Britain's wonder ship may have relieved the Loch Ness monster of a possible rival. This is unfortunate, for competition might have spurred that old favourite to renewed activity. It is time we heard from him again!

The June Mystery Photograph Contest

There was a record entry in the "Mystery Photograph Contest" I announced in the June issue, and the variety of solutions was no less astonishing than their number. Most of the competitors thought the six mysterious objects were milk bottles with straws in them. Others were convinced that the liquid was more attractive than milk, and plumped for lemonade, ginger-beer and other "fizzy" beverages dear to the heart of the average boy.

Ash trays with matches, globes of goldfish, jam jars with spoons, pickle jars and inkpots were other unsuccessful efforts, but there were few suggestions completely wide of the mark. One competitor thought the objects were specimens of the first Edison electric lamp, which was introduced in 1879 and was then called the "red hot hairpin in a bottle," but the palm for originality must be awarded for the confident statement that the photograph showed birds and dogs looking out through holes in glass!

The photograph really was a view from above of Kemex flasks, each containing water and having a glass stirring rod in it. A lamp on the left and slightly above the level of the table cast long shadows, and the flasks acted as convex lenses, concentrating rays passing through them into bright spots and curved streaks of light within the shadows.

So many meritorious entries were submitted that I had great difficulty in making a final selection. The most complete solution was submitted by Donald MacKenzie, Peterhead, who wins the prize of 10/6. The entry of E. W. Oglethorpe, Harrow, was so near the winner's in merit that I have awarded him a special prize of 7/6, and in addition there are five consolation prizes of 2/6 each.

Air Liners Across the Oceans

The article on page 432 will be of special interest to all readers, in view of the schemes now being pushed forward for establishing air lines across the Pacific and Atlantic Oceans. It is written by Captain Sergievsky, a famous American test pilot, who explains how he tries out great flying boats before they pass into service.

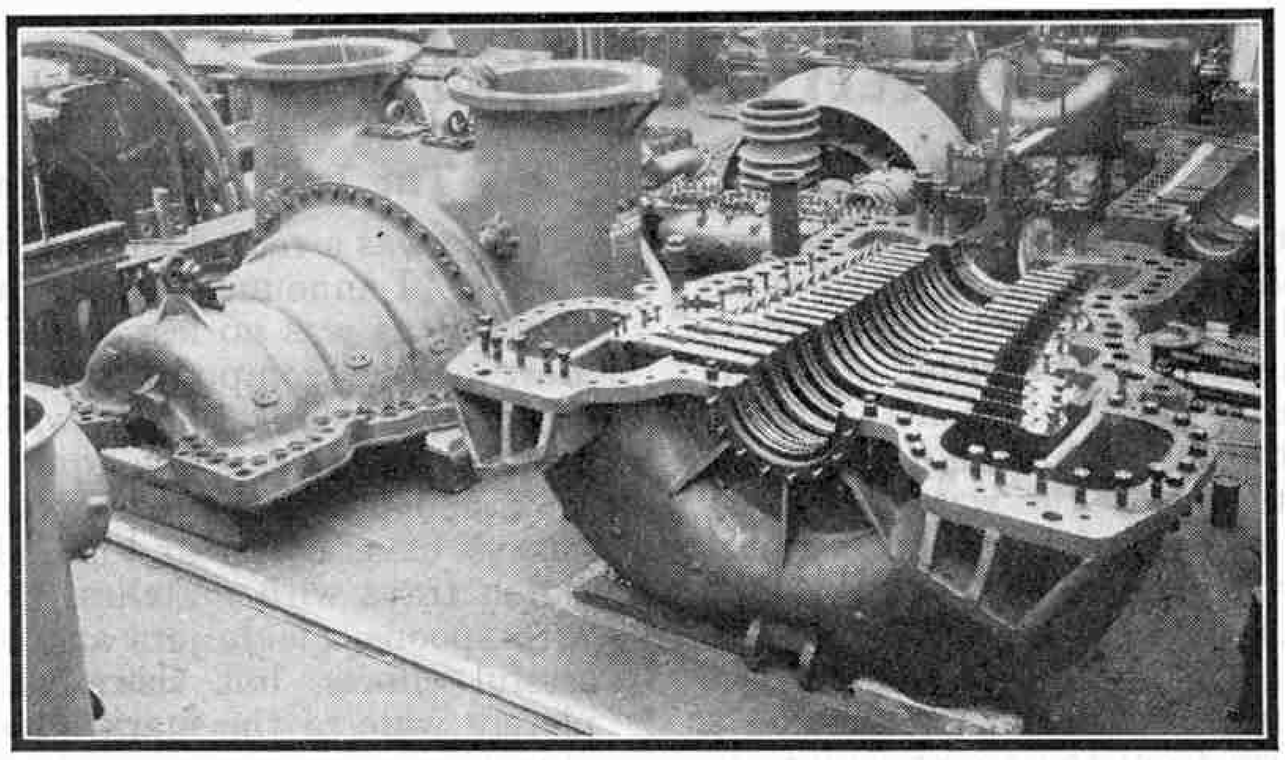
The machines that Captain Sergievsky flies are built by the Sikorsky Aircraft Corporation, of which he is the chief test pilot, and include the famous "China Clippers" that will be used on the service from San Francisco to China by way of Honolulu. Trial flights have already been carried out, and next month I hope to publish an article explaining how machines are flown over the 8,705-mile route across the Pacific Ocean.

Europe's Largest Electric Generator

New 105,000 kW Unit at Battersea Power Station

A LARGE electric power station is one of the most fascinating places in the world. The huge machines in it work continuously at very high speeds, and the enormous power they generate passes outward through a network of underground wiring to light many thousands of electric lamps and to drive innumerable electric motors. The central feature of such a station is the turbo-alternator, the combination of turbine engine and dynamo that actually generates electricity, and the machines of this kind in large stations are now of great size and power.

The new Battersea Station of the London Power Company is a typical example of a modern installation. It is not yet finished, for only half of the scheme has been completed, but already it includes two units of 67,200 kW each, and a third, which was put into commission in September of last year, that has an output of no less than 105,000 k.W. This third unit is the most powerful ever installed in Great Britain, its capacity being 40 per cent. above that of the next in size in this country, and it also is the largest yet made for European installation. It was built by Metropolitan-Vickers Electrical Co. Ltd., to the design of Sir Leonard Pearce, Engineer-in-Chief of the London Power Company, and is a masterpiece of engineering that has contributed greatly to the remarkably high efficiency of the Battersea Station the three great sets of which have a total capacity of 239,400 kW.

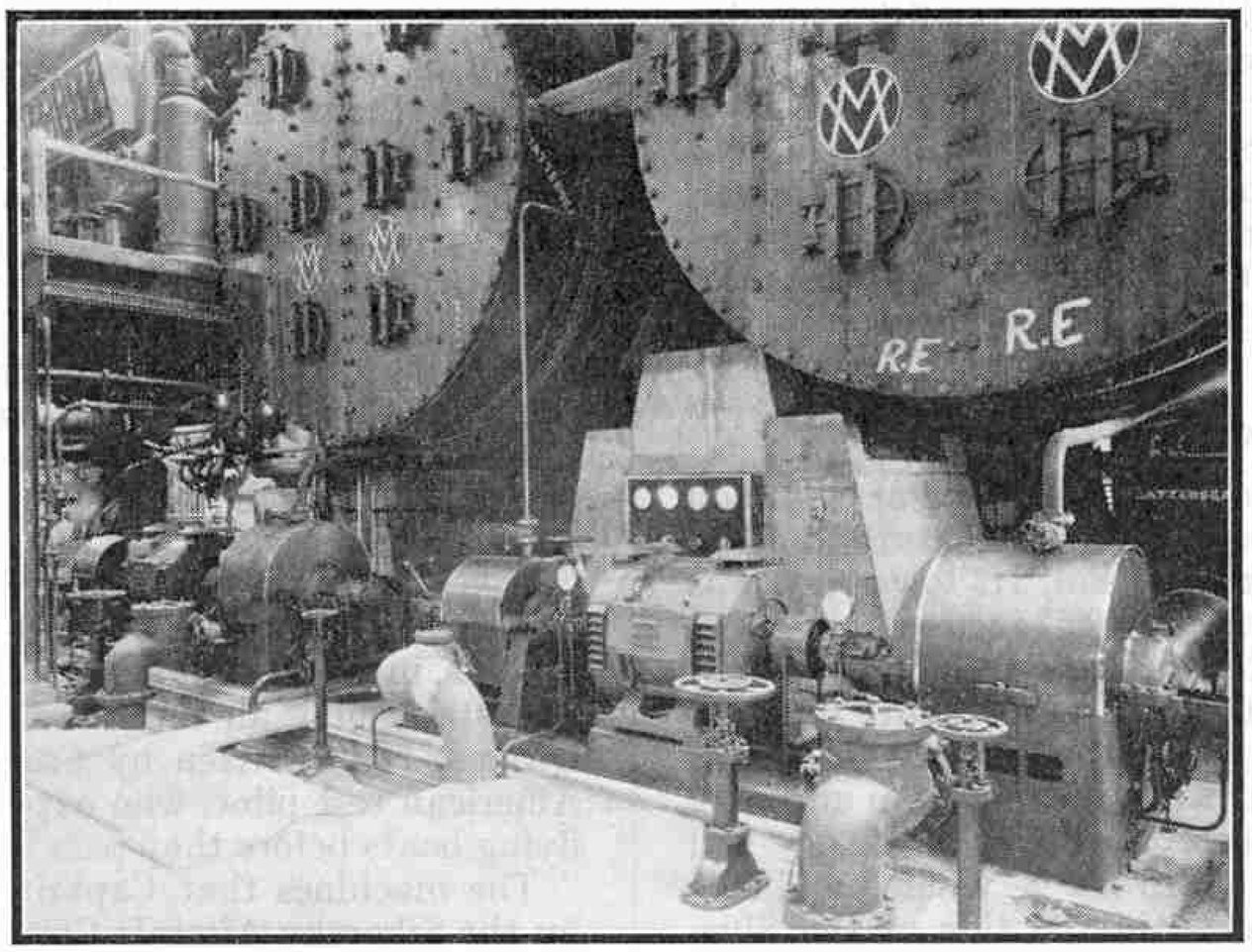


The upper and lower sections of the intermediate pressure cylinder of the 105,000 kW turbo-alternator at Battersea Power Station. The photographs to this article are reproduced by courtesy of Metropolitan-Vickers Electrical Co. Ltd., Manchester.

The tremendous power developed by the turbine of this great turbo-generator can best be realised from the fact that only 25 of them would be required to drive the whole of the generators at present in use in Great Britain for the production of electric light and power.

No less than seven tons of water have to be changed into steam every minute to keep it running, and the steam enters them at a pressure of 600 lb. per sq. in. and a temperature of 800 to 850 deg. F.

A turbine dealing with this enormous quantity of steam must be exceptionally large, and that of the 105,000 kW set at Battersea has three separate cylinders, for steam of high, intermediate and low pressure respectively, and the steam passes through each in turn. It first enters the high pressure cylinder, and there passes in a zig-zag course over rows of curved stainless steel blades set round the circumference of a series of diaphragms or rings fastened to the rotor, which is set in motion by its pressure. Between the rows of moving blades are others, fixed to the cylinder casing, that serve to guide the steam so that it does its work efficiently.



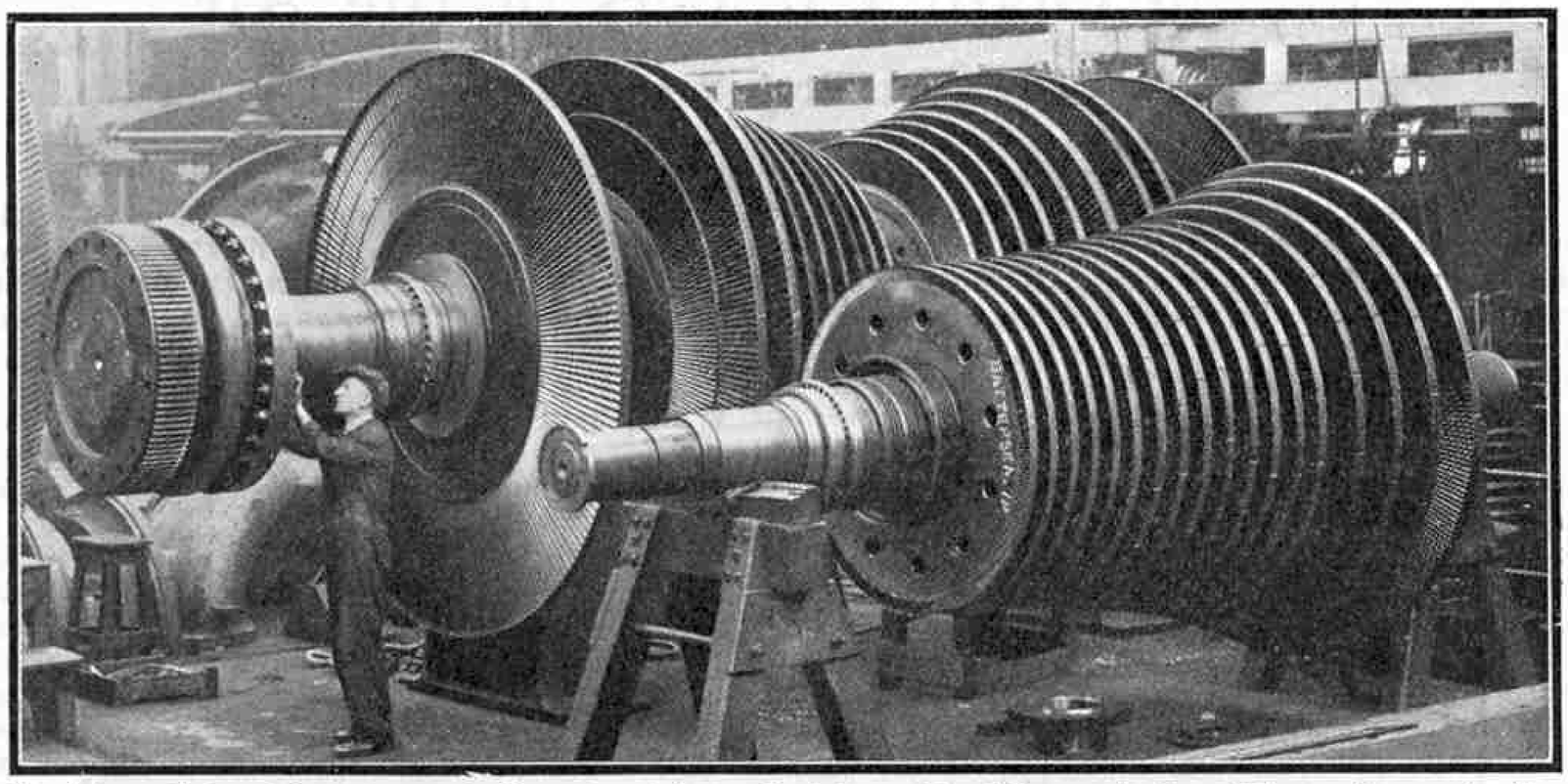
Motor-driven extraction and drain pumps. The condensers can be seen behind them.

The blades of each row are larger than those of the one before it in order to allow for the expansion of the steam as its pressure is reduced. For the same reason the intermediate and low pressure cylinders are larger than the first through which the steam passes, and the blades also are much longer. This can be seen in the upper illustration on the opposite page, which shows the rotors of these cylinders and gives some idea of their enormous size. The rotor in the foreground is that of the intermediate pressure cylinder, and behind it is the low pressure rotor, which is much larger.

Another interesting point is that the smallest blades of the low pressure rotor are in the middle. The reason for this is that the steam enters the cylinder at its middle and works its way towards the ends, instead of passing straight through from one end to the other, as it does in

the two cylinders through which it has already passed. The largest blades of this rotor are about 2 ft. long and would have had to be made much larger if the flow of steam had not been divided in this manner.

The three cylinders are arranged in line and connected by pipes through which the steam passes from one to another. The connection between the high and intermediate pressure cylinders is provided by two tubes under the floor level. The pipes leading to the low pressure cylinder are overhead and are of enormous size, for the pressure on the steam has been considerably reduced, and its volume correspondingly increased, by the time it reaches them. These pipes can be seen in the lower illustration on the opposite page.



The intermediate and low pressure turbine rotors. The smallest rings of the latter are in the middle, as steam enters the low pressure cylinder in the middle and is exhausted at the ends.

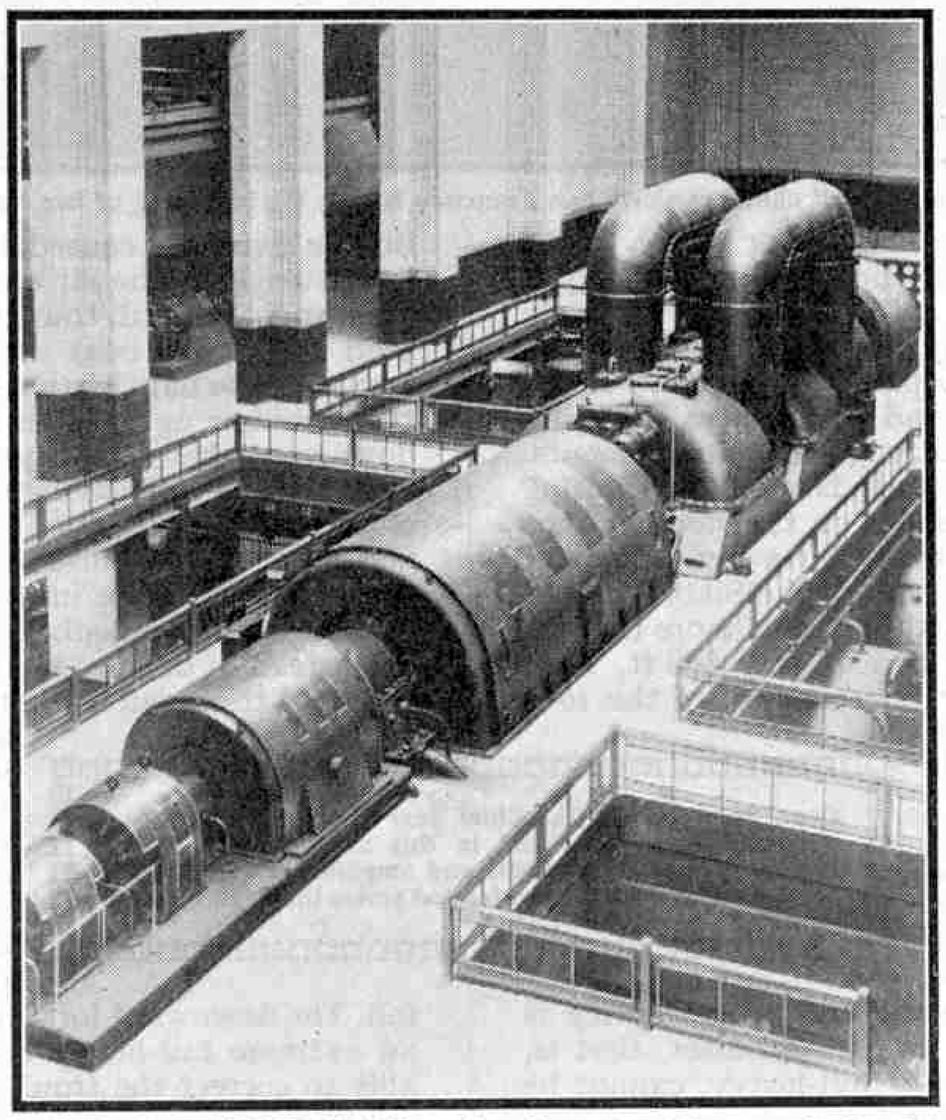
Care is taken to prevent loss of heat as the steam passes through the turbine. For this purpose the high and intermediate pressure cylinders and the great tubes leading to the low pressure cylinder are lagged with plastic magnesia and asbestos, and covered with steel plating. The high pressure cylinder has a coating 1 in. in thickness of a special temperature resisting material.

The pressure of the steam leaving the last of the three cylinders is less than that of the atmosphere, owing to the action of extraction pumps included in the plant. Its temperature is roughly that of boiling water, but it is rapidly cooled when it comes into contact with the surface of the condenser into which it passes. There are two condensers, and each contain 7,000 tubes, 24 ft. in length and 1 in. in diameter, through which cooling water flows. Thus there are no less than 65 miles of tubing in the two units, giving a total cooling area of 90,000 sq. ft. Every minute 60,000 gallons of water are circulated through the tubes, this vast quantity being taken direct from the Thames. It passes through screens to a pumping station, from which it is delivered to a common main, and pipes 54 in. in diameter carry it to the condensers.

Three boilers are installed to supply steam for the turbine, and each is capable of evaporating 140 to 150 tons of water every hour. The quantity of coal required by each boiler is about 300 tons a day.

The three rotors of the turbine are coupled directly to each other and to the moving part of the generator they drive. In this set there are actually four generating units in line with each other, as can be seen in the lower illustration on this page. The largest is the 105,000 kW unit, and in front of it is a generator developing 5,000 kW at 3,000 V. that supplies power for certain auxiliary purposes in the station, together with two smaller units, known as exciters, that generate direct current for producing the magnetic fields required by the large generators.

An alternator comprises a moving part, known as the rotor, and one that is stationary and is called the stator. The latter carries the windings through which passes the current that produces a magnetic field in which the rotor spins, driven by the turbine, with the result that current is generated in its windings. The rotor of the 105,000 kW set weighs 82 tons, and this immense mass, together with the rotors of the turbine, spins round at the rate of 1,500 r.p.m. The speed of its rim is no less than 260 m.p.h. which means that every particle of metal on its edge travels $4\frac{1}{2}$ miles in a minute. In spite of its enormous speed the rotor runs smoothly and easily, for it is very carefully balanced and before installation it was tested at a speed considerably higher than that at which it was designed to work.



General view of 105,000 kW turbo-alternator. The overall length of the set is about 120 ft.

The stator too is of enormous size. Its total weight is 148 tons and, with the exception of the steel yoke that carries the windings, it was built up on the site. The yoke itself was completed at the Metropolitan-Vickers works at Manchester. It alone weighs 42 tons, and is 24 ft. 1 in. in length, 11 ft. 4 in. in height and 12 ft. 6 in. in width. It is so bulky that special arrangements had to be made for its transport by rail to London, for its width is nearly 3 ft. more than railway standards allow. In some places the truck carrying it had to travel on the wrong line; in others the track had to be moved sideways to allow it to pass lineside structures; and in one instance a signal had to be partially dismantled. The journey was made at carefully selected times, and the passage through tunnels, past stations or under bridges where clearances were very small was made extremely slowly.

A Test Pilot at Work

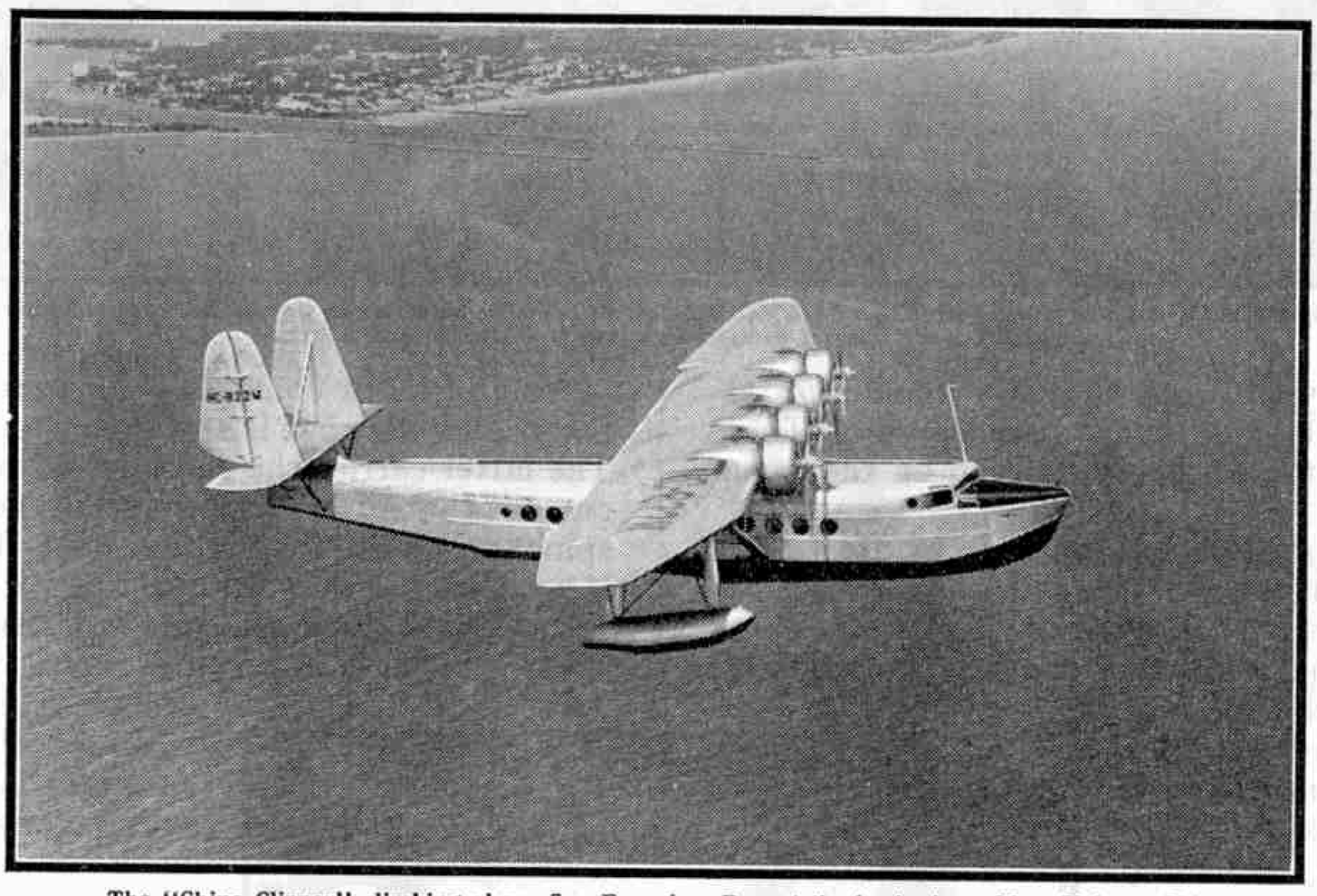
Flying Giant Clippers of the Air

By Capt. Boris Sergievsky

AT my finger tips are the throttles, soon to unleash engines of 3,000 h.p. Underneath me is a wonderful structure of fabric, wood and alloy metals, weighing 40,000 lb. or nearly 18 tons. In the cabin, surrounding me and my assistants, are 90 instruments, each telling at a glance part of the composite story of performance; and as I sit in the upholstered pilot's seat I look at the three-bladed propellers ticking over in the afternoon sun, and wonder: "How will she fly?"

Test flying a great flying boat is like no other job in the world. I do not put the mammoth craft through thrilling evolutions, such as long dives and spins, but I do give her a thorough workout. For it is my duty to make sure that each new machine is airworthy, and that she will carry her cargoes of human beings and goods long distances with safety.

Before I take any new flying boat into the air, I make extensive taxiing tests, executing slow and sharp turns down, across and up wind. I speed the ship along the surface until she climbs up on the step ready to take off, but at this stage of the tests I have to make I do not permit the hull to clear the water.



The "China Clipper" climbing above San Francisco Bay at the beginning of her flight to China.

My job is confined to handling the flying boat. Naturally I cannot attend to all the necessary tasks, and a crew of possibly six engineers accompanies me during taxiing runs. They observe the hull for leaks and the side floats and other parts for excessive vibrations, and watch the connections of wings and tail surfaces—in brief, they keep an attentive eye on all parts that might develop ailments.

Piloting any flying boat, no matter how large, is much like piloting a trim racing boat. I get up speed until she is on the step. At that moment the suction is broken, and I can get her away quickly. I have flown a lightly loaded 19-ton flying boat of the Sikorsky S-42 type off in less than seven seconds, and with a load of more than 19 tons, she took off in 18 seconds after a run of only 800 ft. That gives an idea of the tremendous power poured out by the four Pratt and Whitney "Hornet" engines of 750 h.p. each with which she is equipped, and the cleanness of her design.

Although we cannot know how such a giant flying boat will perform until she finally takes to the air, we do know through careful engineering that she is inherently stable. For instance, by weighing the machine on three scales we find where the centre of gravity is located, but the reaction of the airflow on the stabiliser, that is, whether it will cause the ship to be nose or tail-heavy, cannot be known until we are actually off the water.

Contrary to testing military aeroplanes, the first and cardinal rule in test flying amphibians and flying boats is to take no unnecessary chances. So, when ready to take off on the maiden trial flight, I first test the engines to make sure they are delivering full power. Then I set the stabiliser at the neutral position. With the engines ticking over rhythmically I reach upward to the four throttles, suspended from the cabin roof, and push all four forward together, opening up gradually.

As the flying boat gathers speed, and climbs up on the step of the hull, I begin to try the controls, moving ailerons, rudder and flipper slightly. Through the cabin windows I can see the ailerons move up and down—but will the plane respond? I know after running a very short distance. By that time the great pontoon has risen three feet in the water and we are skimming along at 50 m.p.h. on the step. Yes, the controls are beginning to "take hold." A moment later, with a crescendo of power, the big Pratt and Whitney "Hornet" engines pull the big machine into the air.

From that instant until we skim down to a landing I never have time to think of possible difficulties. True, unexpected things sometimes happen, particularly in trials of new equipment. For instance, when testing one of the 19-ton S-42 series, I was to try out the effectiveness of a new type wing flap. This lengthy "air brake" extends the entire length of the huge wing from aileron to aileron, a total distance of 64½ ft. The flap measures 32 in. from front to rear, and contains 172 sq. ft. of surface, far more than the wing of a small aeroplane.

As the machine roared forward at an altitude of 6,000 ft. I applied the flap, turning the lever that caused it to move downward. The resulting change in the angle of the air stream was expected to move the centre of pressure backward, thus creating a nose-heavy condition that would send the flying boat downward in a mild dive. In fact, before applying the flap I braced myself for the dive and prepared to roll the stabiliser up in order to help to pull out of it. Instead of going downward, however, the nose suddenly rose when the flap took hold, and the huge flying boat actually tended to turn into a vertical climb and loop the loop. I speedily pushed the control wheel forward and rolled the stabiliser down to overcome the climb and bring the machine once more into level flight.

"Why," I remember asking myself, "did the flap send us up instead of down, as expected?"

I tried to visualise what had happened, applying in a few seconds all the experience and engineering knowledge at my command in order to untangle the mystery. Soon I understood. The tremendous downwash from the lower side of the wing and the flap on the wide hull, which the flap almost touched when in the down position, and on the tail surfaces, produced very much the effect of a waterfall. The downward force in fact was so great that it created suddenly an extreme tail-heavy condition. With that knowledge, we were able to correct the trouble.

Flaps make possible amazing performances with these transoceanic flying boats. By winding down a flap to a maximum angle of 40 deg. the pilot converts a speedy wing into a wing of very high lift, enabling him to land at a speed of some 60 m.p.h. Without the flap, he would land at 90 m.p.h.

The flap is not the only mechanical novelty that is proving its worth on these giant machines. On the Sikorsky S-43, the first of a new series of twin-engine amphibians, we now have propellers that by means of governors can be made to turn at constant speeds, no matter whether the pilot is climbing, flying level or diving; brakes for stopping propellers in mid-air; and adjustable tabs for setting

Capt. Sergievsky is the Chief Test Pilot of the Sikorsky Aircraft Corporation, and in this article describes test flights in large flying boats and amphibians designed for service on air lines in America and across the Pacific Ocean.

control surfaces at any desired angle. These relieve the pilots of wearisome duties in unusual conditions of flight.

For instance, suppose I desire all propellers to turn at 1,800 r.p.m. I make the desired speed-of-rotation setting, and after that, the hydraulic system fixed to the propeller hubs takes over the job. In taking off, I open the throttles and the propeller revolutions mount up to 1,800 a minute. Then as increased power from the engines pours in, which with the more common type of propeller would increase the speed of revolution further, the pitch of the blades changes automatically so that they take bigger bites of air and thus provide greater pull. If I dive, the blades assume an increased pitch, but do not spin.

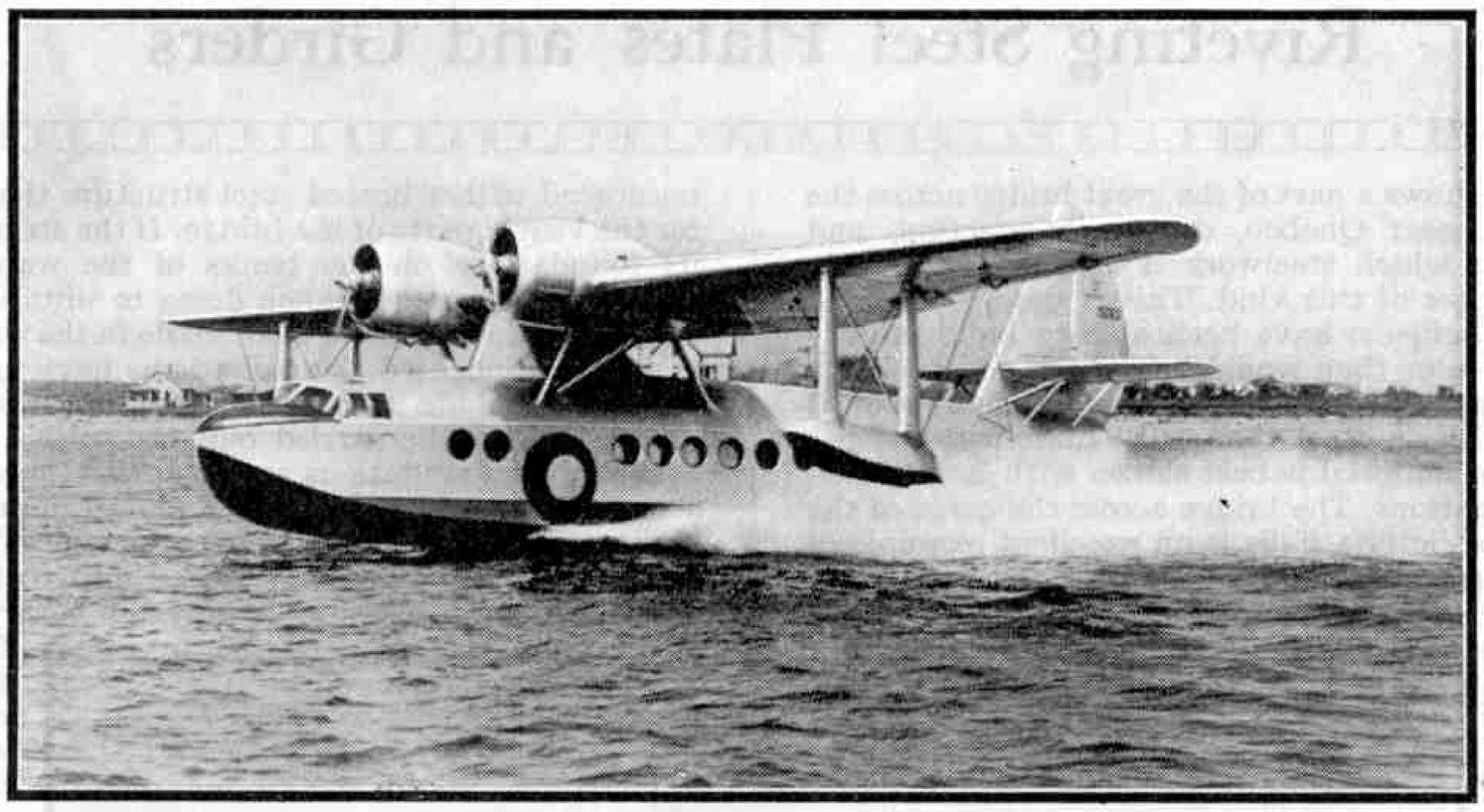
Suppose on a long flight it becomes necessary to shut off an engine for adjustments or repairs. Ordinarily, when I merely close the throttle and break the electrical circuit, the propeller continues to mill around, and in time this wind-milling causes severe vibration that might hammer the engine to bits. A milling propeller located on the leading edge of the wing also blankets off a section equal to the diameter of the propeller itself. This is equivalent to pushing a disc of that size through the air. The four propellers on the S-42 actually blanket one-third of the carrying surface, and also spread a disturbance over the unblanketed area when they are milling.

What happens when I cut off one of the engines of the Sikorsky S-43, however. All I need to do then is to open an air valve. This starts a mechanical pump that by means of a belt and internal expanding pistons applies hydraulic pressure to the particular propeller involved, and in five seconds it stops.

Robot pilots save the human pilots much physical labour, but of course I handle the controls myself most of the time when testing. Recently we have added "tabs" to the control surfaces. These are really small auxiliary controls that when set in one direction tend to drive the control in the opposite direction. For instance, if the machine for some reason is flying left wing down, I set the "tab" on the left aileron in an upward position. The air stream then forces the aileron downward, and this in turn acts to raise the wing. Among the 90 instruments in the pilot's cabin is one that tells me at a glance the angles of all "tabs." At any moment I know exactly how each is placed, leaving no guesswork in their use.

It is a physical impossibility for one man to watch all instruments, however. Both when taking off and on a trial flight I watch the tachometers, which register revolutions of the engines, and the manifold pressure gauge most closely. Other instruments, including fuel pressure gauges and thermocouples, which tell at a glance the temperature of base and head of each cylinder of each engine, are located on panels in front of the mechanic, who is stationed directly behind me on a small seat.

Then I have other instruments that demand occasional glances. There are the ordinary and directional gyroscopic compasses, the sensitive altimeter, and indicators for the air speed, banks and turns and the rate of climb. All these are on a panel directly in front of the wheel, and there also are instruments that govern the automatic pilot, indicators for the flap position and others that show the oil pressure within the flap control system and the positions of the tabs. Two clocks are included for good measure.

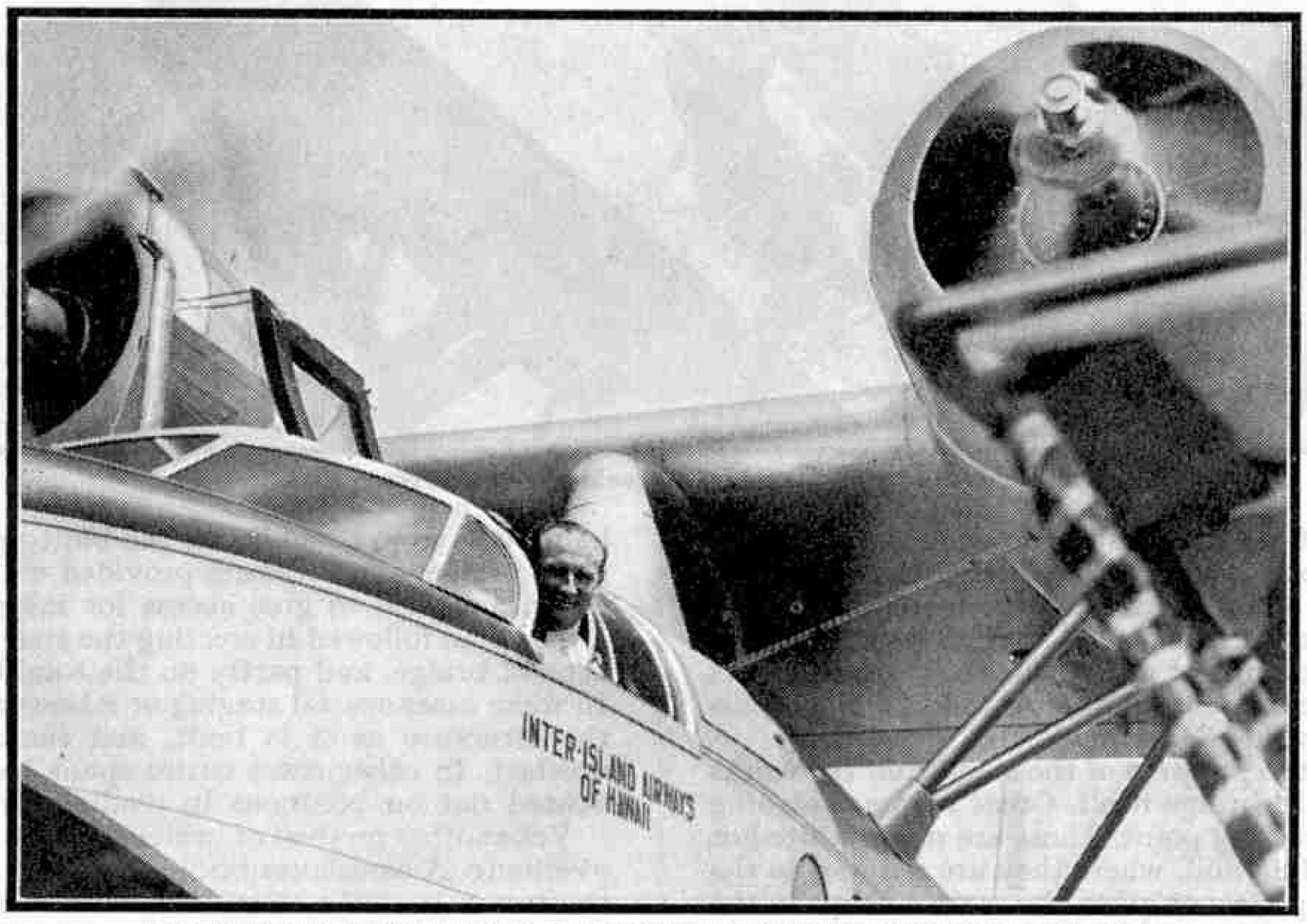


The Sikorsky S-43 amphibian on the step, immediately before taking off. The twin-engines of this machine develop 750 h.p. each at a height of 7,000 ft. and give a maximum speed of 200 m.p.h.

The great flying boats of to-day are of giant size and of very large carrying capacity. In one flight I made in the Sikorsky S-42, the pay load was 16,608 lb. This is the equivalent of 93 passengers, or of freight consisting of 7 light motor cars. More than 5,000 sq. ft. of metal is required to cover the wing and hull of one of these flying boats, and the enormous extent of surface they possess can be realised from the fact that 600 gallons of paint are used on a single machine. This quantity includes the priming coat, lacquer and bituminous paint as well as the dope required for the fabric, and is sufficient to give 60 cottages of average size one coat each.

No fewer than 400,000 rivets are used in building each machine, and this contains more than 1¼ miles of cables and a mile or so of electric wiring.

The latest of the Sikorsky flying boats that I have flown in tests is the S-43, an amphibian that makes no concessions in performance or efficiency to land machines. In this amphibian Igor Sikorsky, the famous designer, has achieved the first large commercial passenger-carrying flying boat capable of a speed of about 200 m.p.h. It is a high wing monoplane with a two-step hull and an undercarriage of the retractable type. It has two Pratt and Whitney "Hornet" engines and, as I have already explained when describing my trial flights, the airscrew is of constant speed and its pitch is varied automatically to meet requirements.



Capt. Sergievsky in the cockpit of a giant flying boat ready to take off on a test flight.

Although the "Clipper Ship," as the great four-engined Sikorsky S-42 is often called, seems large compared with the liners that ply daily on the air routes from coast to coast, larger flying boats undoubtedly will appear in the near future. The two pilots and mechanic required to watch all the instruments undoubtedly will be able to fly them, however, for fortunately the number of indicators will not increase in proportion to the size of the machines.

In great 100,000 lb. flying boats of this kind, powered by six or eight engines, passengers one day will cross the Atlantic on daily flights and fly across the Pacific on regular schedules. Nor will that be the limit. Cost and economical operation only stand in the way of ocean air liners weighing from 150 to 250 tons, great machines many times larger than the present Clipper ships. These amphibians or flying boats of the future will fly 5,000 miles without landing for fuel and will carry 100 passengers in less than a day from America to Europe.

Whether we shall cross the oceans in the stratosphere, sealed like so many sardines within air-tight cabins, is a moot question. I rather expect these ocean crossings to take place at altitudes of 15,000 ft. to 20,000 ft., which is low enough for personal comfort, yet sufficiently high to avoid the storms of lower levels. In any event, I hope it will fall to my lot to test fly these great super-clippers.

How Great Bridges Are Built

Riveting Steel Plates and Girders

OUR cover this month shows a part of the great bridge across the St. Lawrence River, near Quebec, during its erection, and illustrates the manner in which steelwork is riveted together in building immense structures of this kind. This is the age of steel, and with this material engineers have been able to build mighty bridges with spans far greater than would have been possible with masonry. The construction of even a simple bridge of short span is more readily carried out with steel than with masonry, but the superiority of the modern material is best shown with large structures built in difficult situations. The bridge across the gorge of the Zambesi River below the Victoria Falls is an excellent example of this. In a sense this bridge may have been said to have been built, not in South Africa, but in the yards of the Cleveland Bridge Co. Ltd., at Darlington, for all the members were erected there before they were sent out to the site of the actual bridge.

The use of steel makes also for speedy work, which in many cases is essential. For instance, a road bridge had to be built in a remote part of South Africa over a waterway subject to sudden floods of such violence that uncompleted work would be swept away. The difficulties were overcome by rapidly erecting a steel bridge, and inserting bolts and drifts in the joints and connections in order to make it secure against the onslaught of the floods. Later the joints were riveted in the usual manner, and the temporary fastenings were then discarded.

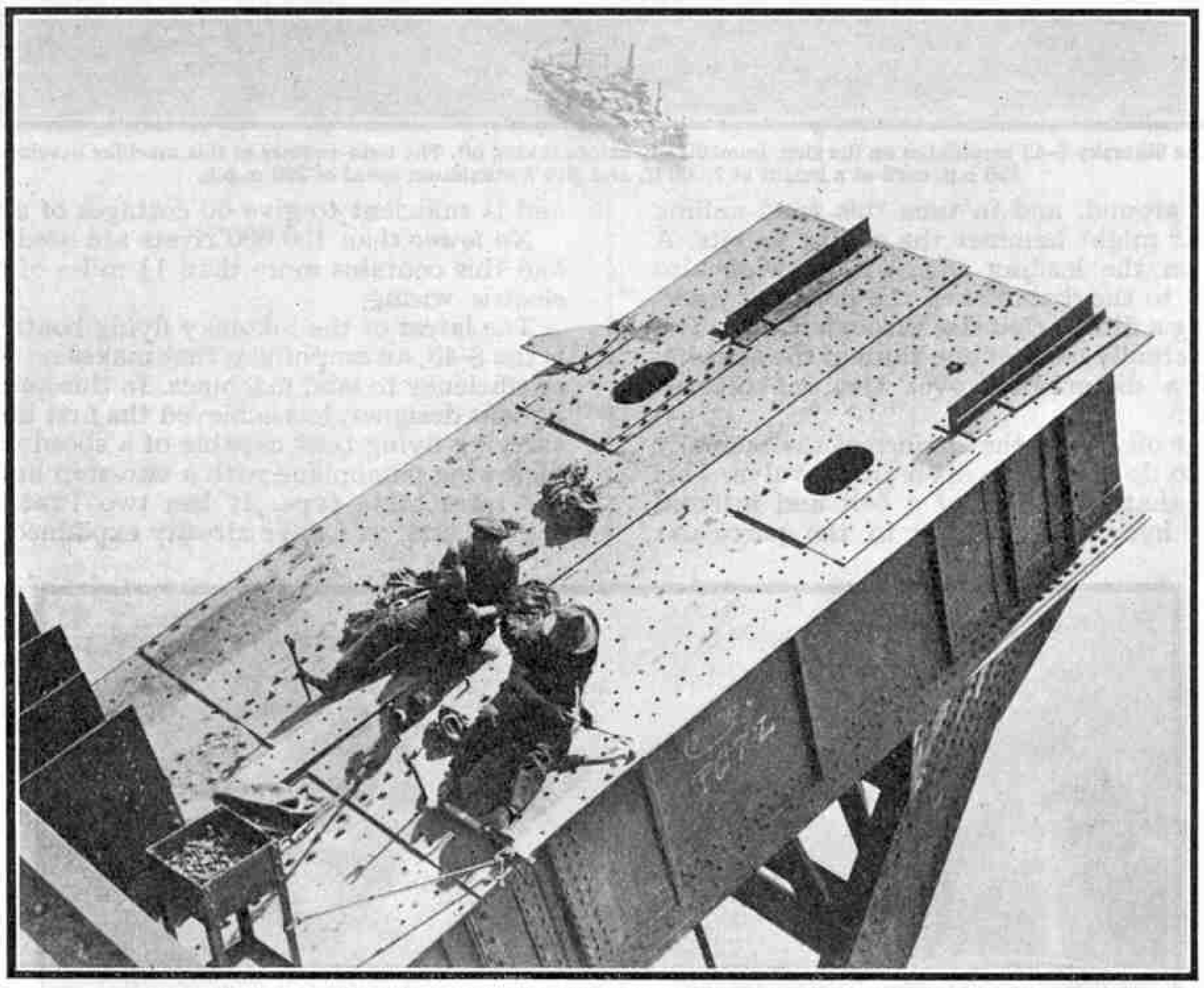
The steelwork of modern bridges consists of plates, girders and other forms of rolled steel sections, and these are built up into members of the bridge structure that take various forms. Outstanding examples that will be familiar to many readers are the tubular main girders of the Forth Bridge, which were formed of plates bent to the correct form and riveted together. The tendency to-day is to use rectangular girders for the main members of bridges, for these are more economical to build, and girders of this kind are to be seen in the Sydney Harbour Bridge.

It is interesting to follow the progress of the steel from the works in which it is produced to the bridge itself. Great ingots, weighing perhaps 20 tons, form the starting point. These are made white hot and are passed on to the rolling mill, where they are reduced to the required sizes in the case of plates, or given the correct shape in the case of other special sections. The steel gives to the tremendous pressure of the rollers and is brought by stages to the form required by the bridge builder. The sections are then cut to length, and drilled and shaped in accordance with the working drawings, and each is given a mark or number for the guidance of the erectors.

In many cases much of this work may be carried out in workshops erected on the site of the bridge, as was done when the great Sydney Harbour Bridge was built. This is impossible when the scene of operations is in more remote country, to which access is difficult, and where skilled labour and other requirements are not available.

In the meantime work at the bridge goes on steadily, for the foundations must be prepared before the erection of the steelwork can begin. The foundations usually take the form of concrete, reinforced with a braced steel structure that acts as a rigid anchor for the visible parts of the bridge. If the structure has only one span, its foundations on the banks of the waterway can be built in ordinary excavations taken down to suitable rock or hard ground. When foundations have to be made in the waterway itself, the work is more complicated, for cofferdams have to be erected, or caissons sunk, to exclude the water from the site before the necessary excavation can be carried out.

When the foundations are complete the steelwork that has been accumulated at the site is then placed in position according to the plans, cranes of various sizes and types being used to raise it. Usually the parts are first bolted into their permanent positions. This method of fastening is only temporary, however, and at the first opportunity the bolts are replaced by rivets. These are made white hot in a special furnace, seized by means of tongs and pushed into holes passing through the plates or other sections that have to be joined. A heavy hammer is pressed against the head of each rivet as it is placed in position. The purpose of this is to keep it close up against the plates through which it passes, and the task of holding it there is that of the member of the riveting squad who is known as the holder-up. On the opposite side of the plate are two riveters, who hammer down the tail end of the rivet, so that the metal completely fills the hole, and shape it like a mushroom. In cases where the surface must be left flat, with no projections, the rivet holes are countersunk. The holder-up often has to work in very cramped quarters. For instance, he may have to creep inside the built-up rectangular members of a great bridge, and these are provided with manholes to allow him to enter, and also to give access for inspection and other purposes.



A riveting squad at work on one side of the main arch of the Sydney Harbour Bridge.

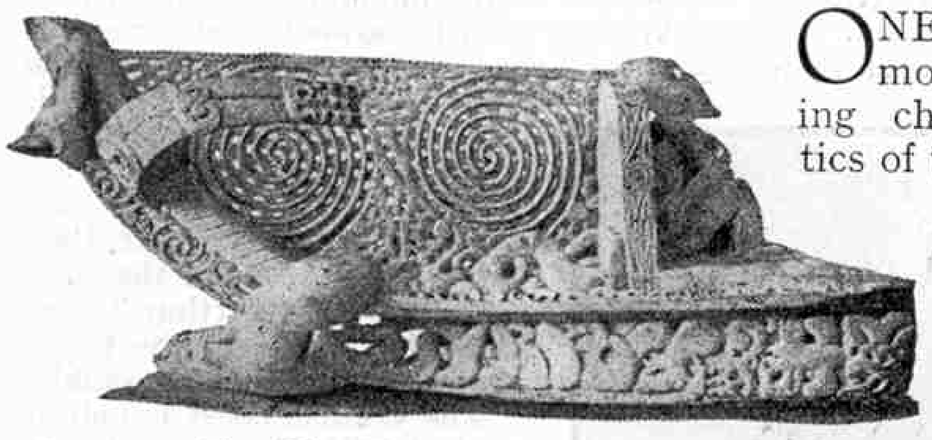
The plan followed in erecting the steelwork depends partly on the type of bridge, and partly on the conditions in which it is erected. In some cases special staging or falsework has been used to support the structure as it is built, and removed when construction is finished. In other cases entire spans have been built on land and floated out on pontoons in readiness for lifting into position.

Yet another method of bridge erection that is often employed is by overhang. A cantilever bridge is readily erected in this manner, for the two halves of a cantilever balance each other as they are built outward on each side from the supporting pier. Arch bridges sometimes are converted into temporary cantilevers, but this is not always possible and then other methods have to be used. In the case of Sydney Harbour Bridge immense cables anchored in tunnels on each bank were used to hold the sections of the arch in position as they were built out from the abutments. The steelwork was erected section by section with the aid of giant cranes, each capable of raising 120 tons, that crept steadily up the completed portion of the arches in order to be in a position to hoist and assemble the steelwork for the next section. The two creeper cranes met at the crown of the arch when this was completed and then slowly returned to their starting points, on their way taking part in the work of erecting the hangers and the deck of the bridge.

The Art of the Maori Carvers

Unique Features of Design

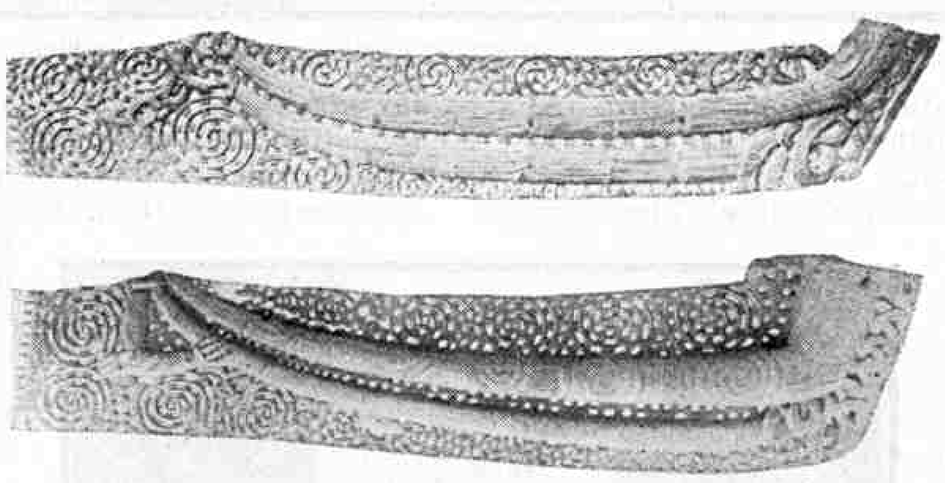
By A. P. Godber



The elaborately carved prow of a war canoe.

ONE of the most striking characteristics of the Maori is his carvings—handsome and intricate in design. Handsome is used advisedly, yet it may be that that description is only understood after some careful and sympathetic study of carving technique. The so-called decorative woodwork on many pakeha dwellings in New Zealand is far less interesting, and lacks those evidences of art which are found in Maori carvings.

The Maori who lived close to Nature had an imagination which had to find some form of expression. He had no written language whereby to transfer his thoughts to books. Thus he used the wood of the bush, suitably embellished with carved scroll-work, as a medium to express his thoughts. The Maori is very conservative and the designs seen in ancient carvings have, in the main, been followed by successive generations of carvers. Augustus Earle, who was draughtsman on H.M.S. "*Beagle*," visited New Zealand in 1827. From an artist's point of view he found much to praise in the Maori carvings he inspected. The symmetry of design and accuracy of the curvilinear details were features that especially excited his admiration.



Ornamental carving on the stern.

In the old days the art of carving was looked upon with sacred awe. Only persons of good birth and breeding were initiated into the carvers' cult, and taught the intricacies of the art. A karakia, or incantation, would be recited at the felling of the tree. Further karakias were necessary at the commencement of the work, and during its progress. Mistakes were regarded as unlucky, both for the artisan and the owner of the work. If a hara (false stroke) were made ill fortune would inevitably ensue. It was equally disastrous to blow the chips from the work. They could only be removed by the hand, or by turning the work over.

The carver and his tools would be tapu during working hours. Even the chips from his stone chisels and gouges were highly tapu. When members of the Ngati-Awa tribe came from Whakatane to carve the Hoturoa house at Thames, a serious sickness befell them while the work was under way. Inquiry revealed the fact that some of the women had used chips from the carvers' workplace, wherewith to cook food. It was Mereana Mokomoko, wife of the chief Apanui, who, by reason of her mana, was able to carry through the necessary ceremony, which overcame the infringement of the tapu, and so stayed the pestilence. (This house, when completed, was a splendid example of the art of the Maori carver, and it is now housed in the Auckland Museum.)

When we consider that the old time carvers had only stone tools to achieve the results we so much admire to-day, we must credit them with an art sense above the average, coupled with a surprising facility in the use of their prehistoric tools. The tohunga carver had no patterns to guide him in his carvings. His fertile brain would imagine the design. Once conceived, the idea would be mentally projected on the object to be carved, the outline, traced with charcoal or other medium, and then the actual carving would commence.

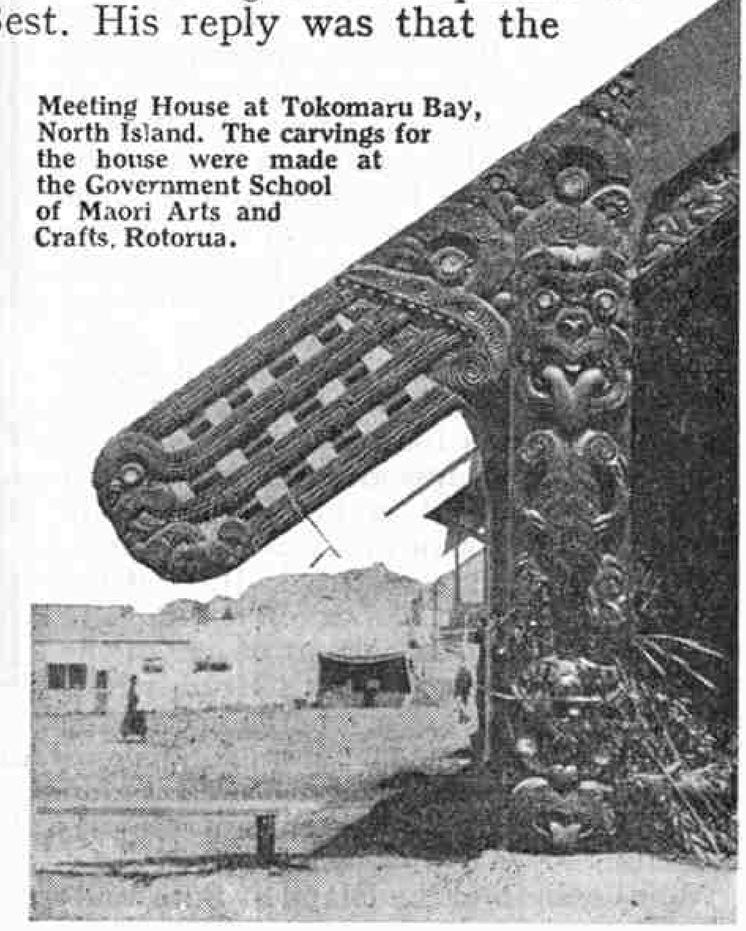
It is interesting to note here that the human figure, with wide variations, predominates in Maori carving. A koruru, the huge figurehead seen on the gable of tribal meeting-houses, seems to be the outcome of the carver to express the features of a toa, or warrior, whose grimaces were calculated to instil fear into the hearts of his enemies.

Another point of interest is that the ancient tohunga scorned straight lines. On the oldest carvings the incisions were of rather a shallow cut, with notches, and lines between. Later methods were to cut deeper. The beautiful curved ground was introduced, turning itself round and round like a comma. It is marvellous how the expert carver would cut the double spiral with its attendant intricate curves without any geometrical aid.

A peculiarity to be noted in old carvings of the human figure are the hands, with only three fingers. In quest of information regarding this custom in old carvings, the writer sought the opinion of the late Mr. E. Best. His reply was that the meaning or reason of such was lost.

It is very difficult to find a Maori who can explain satisfactorily the various patterns and designs. Those who had that knowledge have passed away without handing it down to others.

This article is reprinted, with illustrations, from "*The New Zealand Railways Magazine*" by courtesy of the Editor.



Meeting House at Tokomaru Bay, North Island. The carvings for the house were made at the Government School of Maori Arts and Crafts, Rotorua.

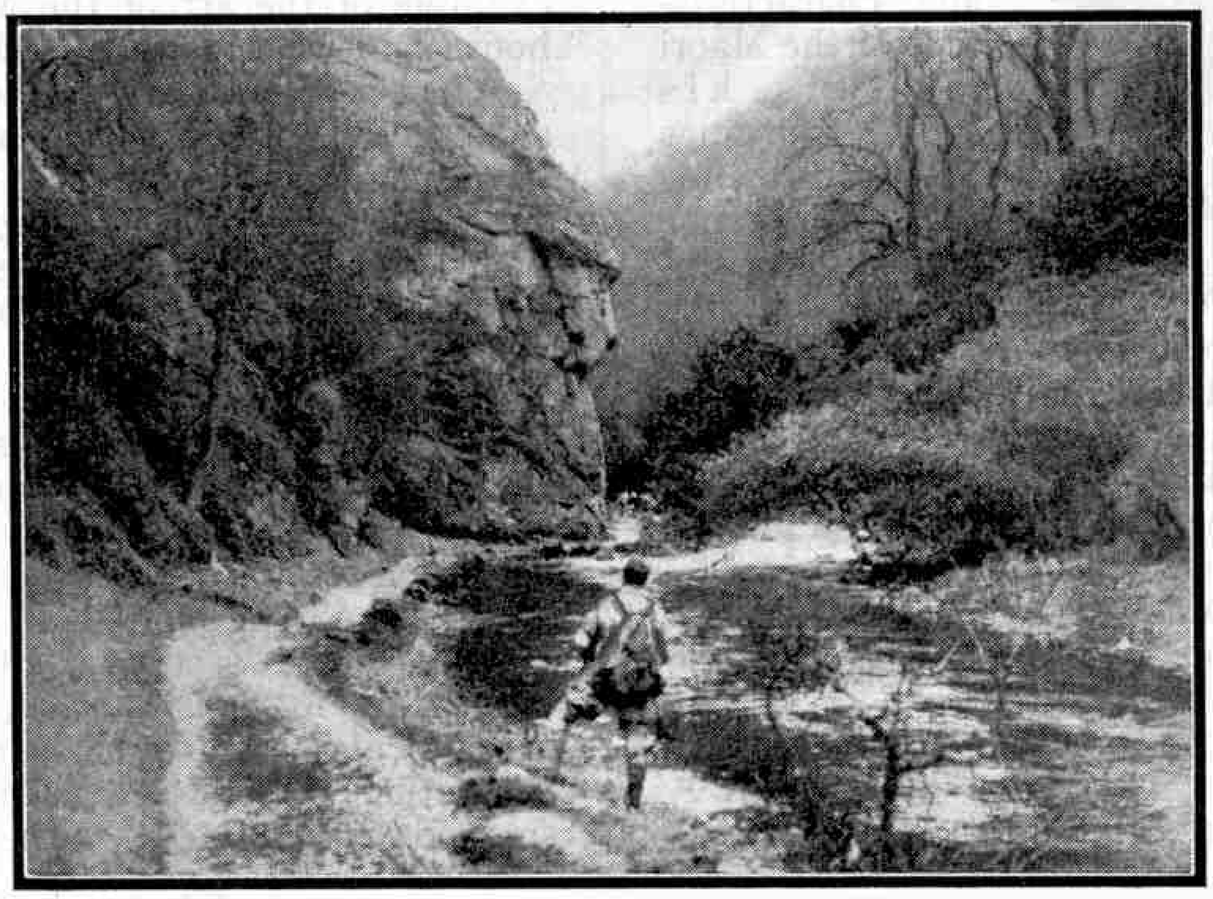
Nature at Work and Play

Strange Rocks and Wonderful Caverns

By Sydney Moorhouse

WE are all greatly interested in such wonderful creations of Man as huge bridges, powerful engines and gigantic buildings. We must not forget that Nature can show us equally astounding examples of her handiwork, however, and in the holiday season of the year we cannot do better than endeavour to see some of the marvellous things that she has fashioned. For thousands of years she has been at work along our rock-bound coasts, among the great mountains, amid the white limestone scars and beside the rushing streams, with the result that Britain is a veritable treasure trove of natural wonders.

Sometimes Nature reveals the delicacy of the master craftsman in weaving intricate and beautiful patterns in crag and cliff; at others she is a playful designer, leaving in her wake fantastic designs of human and animal figures. It was in the latter mood that she fashioned the Toad Rock, which stands beside the main road from Sheffield to Hathersage. This weird creation resembles a gigantic toad crouched in readiness to spring into the Derwent Valley below, and has been modelled out of the gritstone by the combined action of wind and rain.



The Lion Rock, Dovedale, a striking example of natural rock carving.

Lions' heads are favourite subjects for Nature's chisel. There is a magnificent head guarding the entrance to the wonderful rock chine of Cheddar Gorge; and another in Dovedale, on the Derbyshire-Staffordshire border, forms an almost perfect representation of the head of the King of Beasts.

Dovedale is rich in natural wonders and has been said to rival Ancient Egypt for its marvels of architecture. Those in Egypt are the work of man, but in Dovedale are all natural. There are to be seen Tissington Spires, the Twelve Apostles, Reynard's Cave with its fine cathedral archway, and Ilam Rock, aptly described as Nature's own Leaning Tower of Pisa, all carved out of gleaming white limestone.

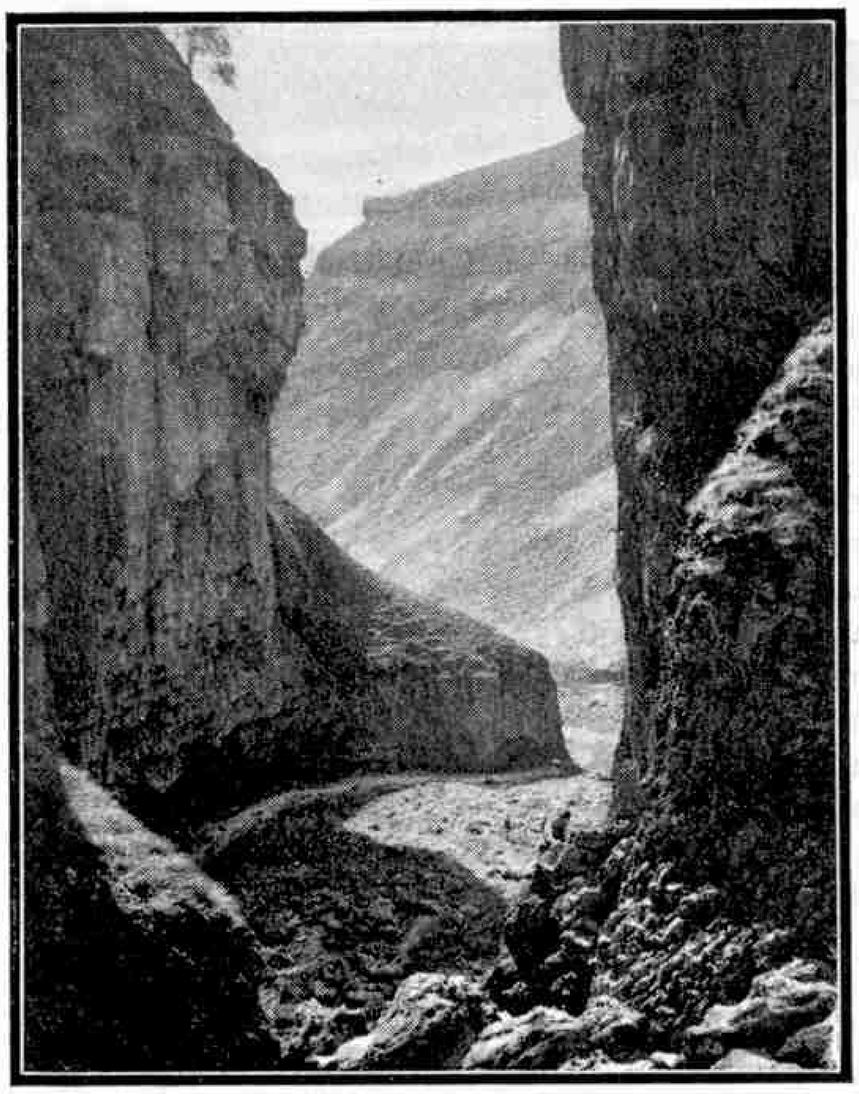
On a hillside above Dacre in Nidderdale, Yorkshire, are the Brimham Rocks, huge pieces of gritstone weathered into diverse shapes. Some are like great heathen idols, one has the form of a giant mushroom and another resembles a dancing bear. Most wonderful of all is the Druid's Idol, which weighs more than 200 tons and yet rests on a base only a foot wide.

Nature would appear to have been not quite so successful in her modelling of human heads, for in many cases the likeness is not easily recognised. Just off the main Beddgelert-Caernarvon road, and opposite the commencement of one of the tracks up Snowdon, is Pitt's Head, which is supposed to bear a resemblance to the head of William Pitt, one of England's most famous Prime Ministers. Near Llanberis is the Queen Victoria Mountain, with a remarkably good representation of her late Majesty, Queen Victoria, lying in state.

When seen from the Island of Bute, and from certain places on the mainland of Scotland, the skyline of the mountains of Arran look very much like a Sleeping Warrior with his arms folded across his breast. An even more impressive example of natural carving is the Witch's Head at Tintagel, Cornwall, the centre of many legends associated with King Arthur. It mounts guard over the mystic beach where they "found a babe upon the sand and that was Arthur," and the resemblance to the traditional witch is unmistakable.

The Cornish coast is indeed packed with fine examples of Nature's handiwork and there is no doubting the fact that the combined forces of the mighty Atlantic, the wind and the rain have had little mercy upon the rock-girt coast of England's westernmost county.

Kynance Cove, near the Lizard, is a remarkable spot. It is a palace of rocks, some perpendicular and others with sides sloping like those of church steeples and pyramids, rising out of a beach of pure white sand. To see it at its best it should be visited when the tide is out, otherwise much of its wonder will be lost. There is the Lion Rock, a couchant lion breasting the foam; the huge Steeple Rock; and the Devil's Post Office, where a piece of paper held near a fissure in the rock is snatched out of the hand and hurled far out to sea. Also at Kynance is the Devil's Bellows, a curious opening into a cave through which air is expelled at certain states of the tide with a roar that has been heard 4½ miles away!



Gordale Scar, a remarkable rock cleft near Malham, in Yorkshire.

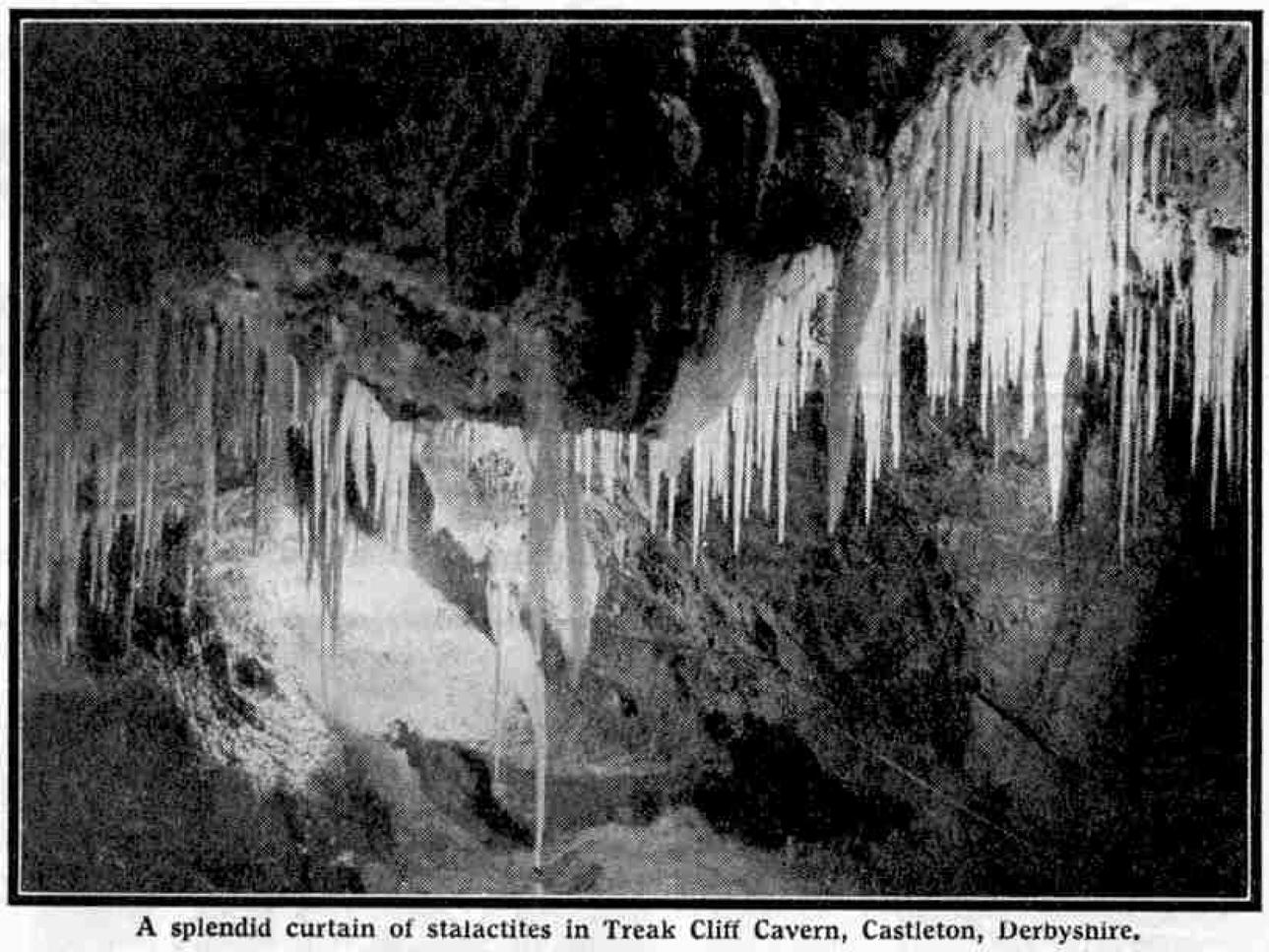
Between the Lizard and Cadgwith is the Devil's Frying Pan, a great cave with a hole in the roof. This cave is best reached by boat from Cadgwith. The sea forms its floor, and in stormy weather foams and hisses in a manner suggestive of satanic cookery. There is a similar feature on the South Welsh coast at Bosherton Mere, some six miles from Pembroke. This is a funnel-shaped opening in the rock that descends to a cave filled by the sea. In rough weather, great columns of water are thrown up and the spectacle is a very fine one.

In the vicinity of Land's End are many mighty rocks called by various fanciful names, such as the Armed Knight, the Irish Lady and Enys Dodman, the last being pierced by a natural arch some 40 ft. high. Eight miles south-west of Penzance is a fine example of a logan stone, that is a great boulder perched so precariously that it sways when it is touched. This example weighs about 65 tons, and is some 17 ft. long and 30 ft. in circumference. In 1824, Lieut. H. C. Goldsmith, a nephew of the poet Oliver Goldsmith, dislodged it with the assistance of a party of sailors. There was a great outcry as a result of this audacious piece of vandalism, and the lieutenant was compelled to replace the rock at his own expense, but it has not swayed so easily since this escapade. There are other logan stones in Cornwall, but the one mentioned is the finest example.

The colossal power of the sea has carved out many great sea caves

amongst the cliffs of Britain. There is one at Land's End that penetrates through hundreds of feet of cliff, and Merlin's Cave, at Tintagel, runs right under the ruins of Arthur's Castle. There are other fine sea caves on the Pembrokeshire coast and among the white cliffs of Flamborough, in Yorkshire, and Great Ormes Head, in North Wales. Some of the best lie off the west coast of Scotland, and Fingal's Cave, on the lonely island of Staffa, is a wonderful spectacle. This penetrates 227 ft. into the island and the highest portion of the roof is 60 ft. above high water mark. The sides and roof of the cave are formed of black hexagonal and pentagonal pillars, and the only other places in the world where similar strange forms are found are at Giant's Causeway, Portrush, Ireland, and on the New Jersey shore of the Hudson River, opposite North York.

Not far from Aberdaron, on the Lleyn Peninsula, North Wales, are some whistling sands. As you walk along the beach the dry sands give out a shrill rasping note that is quite eerie. But beware of coming here just when the tide has gone out or you will be disappointed, for the wet sands do not produce any whistling effect. Only one other beach in the world has this singular property and that is in West Africa, but singing sands are found in the Arabian desert.



A splendid curtain of stalactites in Treak Cliff Cavern, Castleton, Derbysnire.

The Craven district of Yorkshire is rich in natural wonders. Some of the most remarkable are in the vicinity of Malham and include Gordale Scar, a great cleft in the rocks with beetling cliffs on each side, and Malham Cove, a wall of limestone some 300 ft. high, from the foot of which the Aire, or a tributary of that river, issues forth into the green dale. A few miles west are the Attermire Cliffs, where the limestone has been worn into an intricate system of rock protuberances that provides the nearest approach in England to the basaltic "organ-pipe" construction of Giant's Causeway.

In the Craven area also is the Ebbing and Flowing Well, on Giggleswick Scar, which possess the peculiar property of ebbing and flowing at irregular intervals. A sudden flow then completely fills the well, after which the water subsides and escapes. In rainy weather this may happen four or five times a day, but in times of drought days may elapse between successive displays. There is believed to be a natural double syphon in the limestone rock from which the water flows, and models made on this assumption have worked in the same fashion as the well.

The magnificent caverns of Craven were described in the *"M.M."* for December of last year, but there are almost equally fine underground systems in Derbyshire and among the Mendip Hills of Somerset. Near Castleton, Derbyshire, is the recently opened Treak Cliff Cave, which is packed with magnificent coloured stalactites and stalagmites. These are formed by the action of water that has penetrated the limestone rocks. The water is charged with a small proportion of carbon dioxide, and eats away the limestone to form a solution from which the mineral is again deposited when the gas is lost. This happens when the solution drips from the roof of a cave and there, and on the floor where it falls, these columns of limestone are gradually built. Their colours are due to traces of iron, manganese and other metals.

In the same hillside as Treak Cliff Cavern are the Blue John Caves, where the transparent Blue John spar is found. This hillside is the only place in the world where this blue-tinted mineral is known to exist. It was known to the Romans, and vases made of Blue John have been discovered amongst the ruins at Pompeii.

Not very far away is the yawning gulf of Eldon Hole on the flanks of Eldon Hill. This is some 200 ft. deep and from it a long scree leads into an inner chamber 64 ft. lower. The height of this chamber is more than 50 ft. and the walls are covered with fine stalagmite deposits. There are no subsidiary passages.

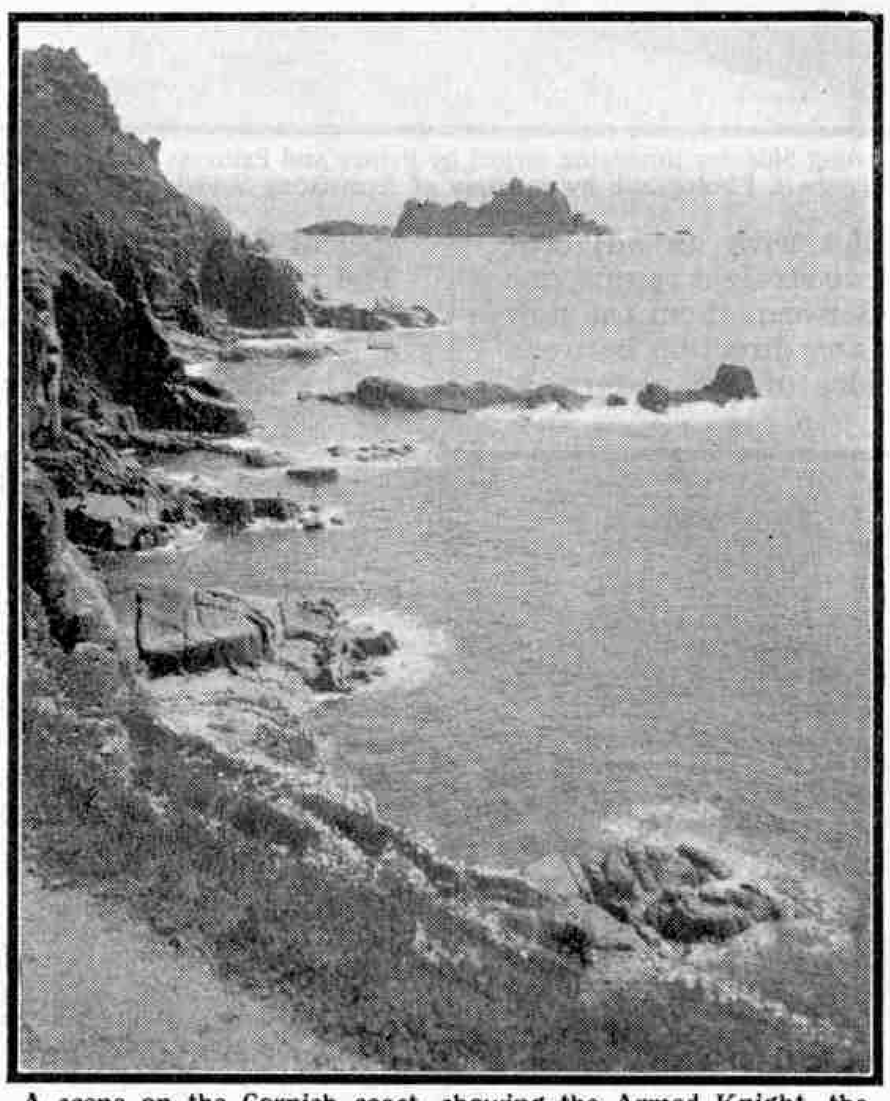
For centuries this chasm had the reputation of being bottomless and there are records of an attempt to fathom its depths made in the reign of Queen Elizabeth, when the Earl of Leicester, who figures in Sir Walter Scott's *"Kenilworth,"* hired a peasant to be lowered into the cavern. We are told how the poor creature was lowered "two hundrel ells" and then hauled out "with great expectations of discovery." The hapless fellow was senseless when he reached the top, however, and died within eight days of a frenzy, never recovering consciousness. Probably he had been knocked on the head by a falling stone.

The whimsical Charles Cotton, Izaak Walton's boon companion, once attempted to plumb the depths with a line and recorded:

"But I myself, with half the Peake surrounded,
Eight hundred, fourscore and four yards have sounded."

It seems likely that Cotton allowed his line to coil itself on one of the ledges of the shaft, and so to give an excessive figure for the depth.

Peak Cavern is at the base of the cliff upon which are perched the ruins of Peveril Castle, and on the walls of its immense underground halls geologists have been able to trace a flow of lava. To the south of Buxton, on the slopes of Grinlow, is Poole's Cavern. This is more than 800 yds. long, and the stalactites and stalagmites in it are said to be larger than anywhere else in the country. There are also many interesting caverns, such as the Great Cumberland Cavern, Rutland Cavern and Great Masson Cavern, in the neighbourhood of Matlock.

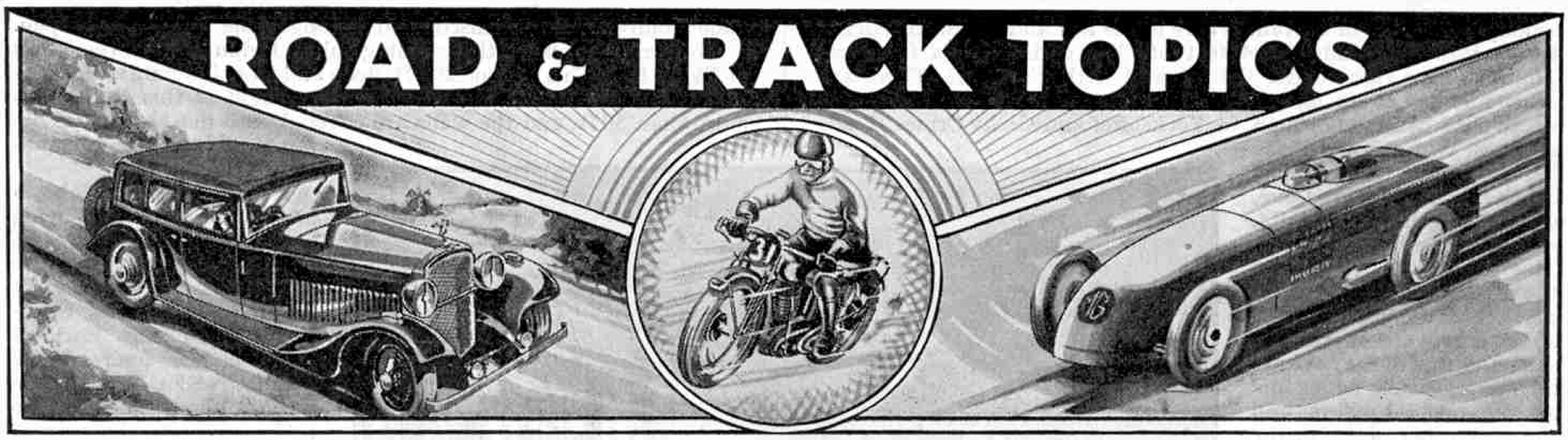


A scene on the Cornish coast, showing the Armed Knight, the rock in the distance, as seen from the Land's End.

At Bradwell, Derbyshire, is the Bagshawe Cavern, the full extent of which has not yet been determined, although passages in it have been explored to a distance of more than five miles. Many remarkable discoveries have been made there. One portion of the cave, known as Calypso's Grotto, is rich in a rose-coloured calcareous deposit about 5 ft. thick. When it is realised that thousands of years may be needed to form a layer one inch in thickness, one can only marvel at the age of this cavern.

The caves at Cheddar, Somerset, have been known to exist for centuries, for between 1125 and 1130 a monk known as Henry of Huntingdon wrote of the "caves under the ground at Cheddarhole" as one of the four wonders of England. These are now open to the public, as is Wookey Hole, another cave in the same neighbourhood. Wookey Hole is noted for the famous, or infamous, Witch of Wookey, now turned into a huge white pillar stalagmite gazing down into the ice-blue depths of the subterranean River Axe. Even more astounding is the chamber known as the Witch's Parlour, which has a span of 135 ft. without support, although its greatest height is but 14 ft. above floor level. Above it are the Mendip Hills, and for millions of years a stupendous mass of solid rock 500 ft. in thickness has borne down on this span, which to engineers seems impossibly flat, without disastrous results.

These Somersetshire caverns are lighted by electricity and this produces wonderful effects among the stalactites and stalagmites.



A Clover Leaf Road Junction in Stockholm

The diagram on the opposite page shows an interesting clover leaf road junction that has been constructed in Stockholm as part of a scheme to solve the city's traffic problems.

The oldest part of Stockholm is situated on an island, which is separated from a densely-populated district on the mainland to the south by a narrow waterway. The bridge formerly crossing this proved insufficient for the needs of modern traffic, which was frequently held up while barges were towed through the waterway. The area therefore has been reconstructed with a wide double bridge across the waterway.

The clover leaf junction forms part of the scheme adopted. It consists of two streets at different levels, which cross at right angles and are connected by three spiral ramps, a fourth ramp being omitted in order not to conflict with an adjacent underground railway station. There are also two straight ramps, one on each side of the group of spiral ramps. Between them the new roads provide routes without cross traffic in any direction between the approaches on the north and south sides of the waterway.

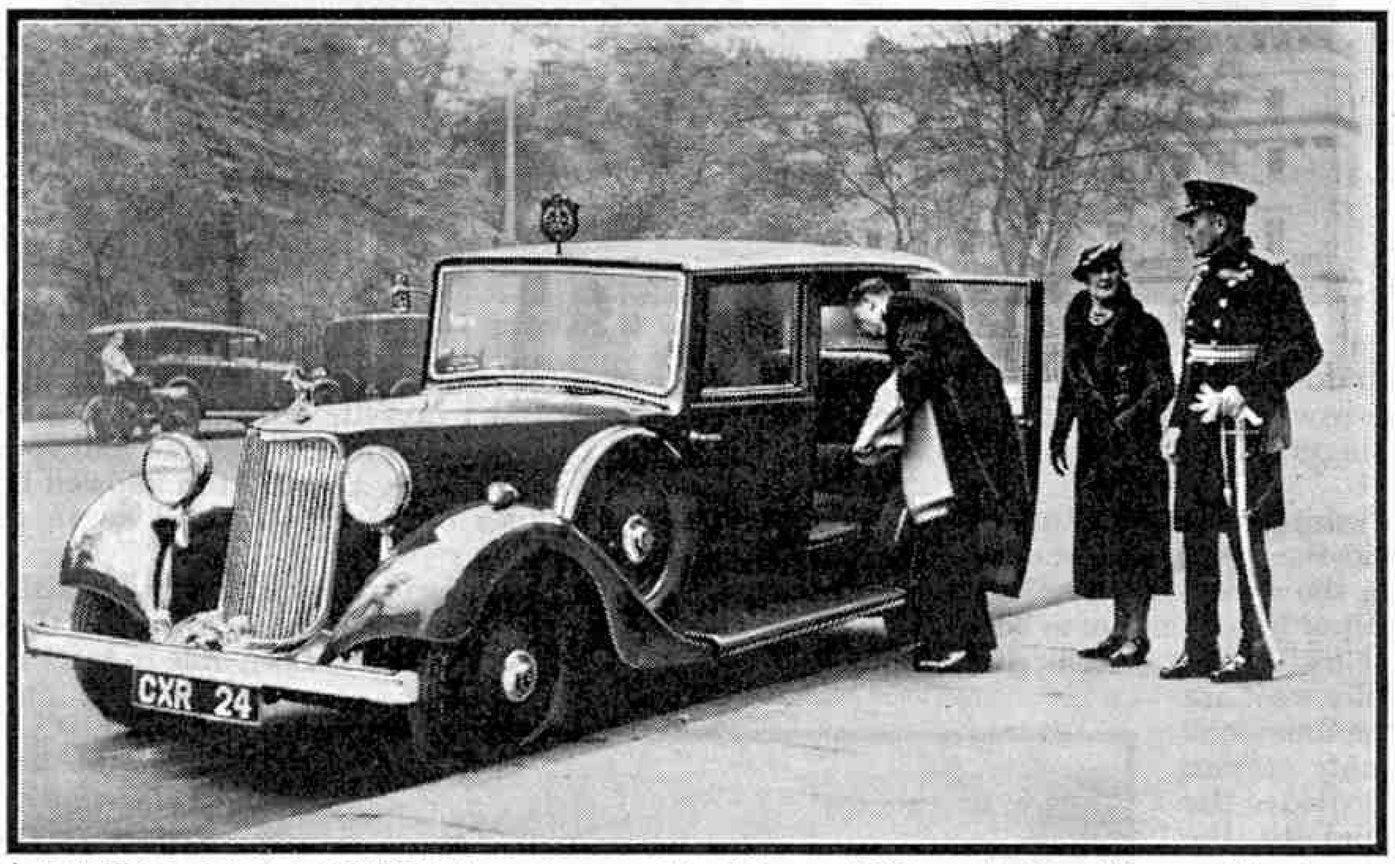
The roadways are supported on concrete viaducts which cover a space of about 16,750 sq. yds., and a restaurant and cinema are being built inside one of the arms of the clover leaf.

A Concrete Road 3,000 Miles Long

In the United States it has been suggested that a concrete road should be built from the Atlantic Coast to the Pacific. The proposal is to make this highway as straight as possible and to avoid cross-roads. It has been put forward by the Pittsburg Chamber of Commerce as a means of finding work for the unemployed, and it is estimated that its construction would keep 200,000 men busy for two years.

The suggested highway would be 3,000 miles in length and would cost about £80,000,000. Much of it would be elevated in order to clear existing roads and railways. It would be separated into two strips, each 45 ft. in width, by a channel through which telephone, telegraph and electric power lines were run, and each carriageway again would be divided into fast and slow traffic lanes. Feeder roads leading to adjacent towns would join the highway at intervals of about 10 miles, and if necessary the road would be forked at each end, the two branches on the eastern side of the continent serving New York and Boston, and those in the west leading to Los Angeles and San Francisco respectively.

There is already one great highway stretching across the North American continent in the United States. This is known as the Lincoln Highway. It was not planned as a separate road, however, and has many crossings, is extremely tortuous, and varies greatly in breadth and in the character of its surface.

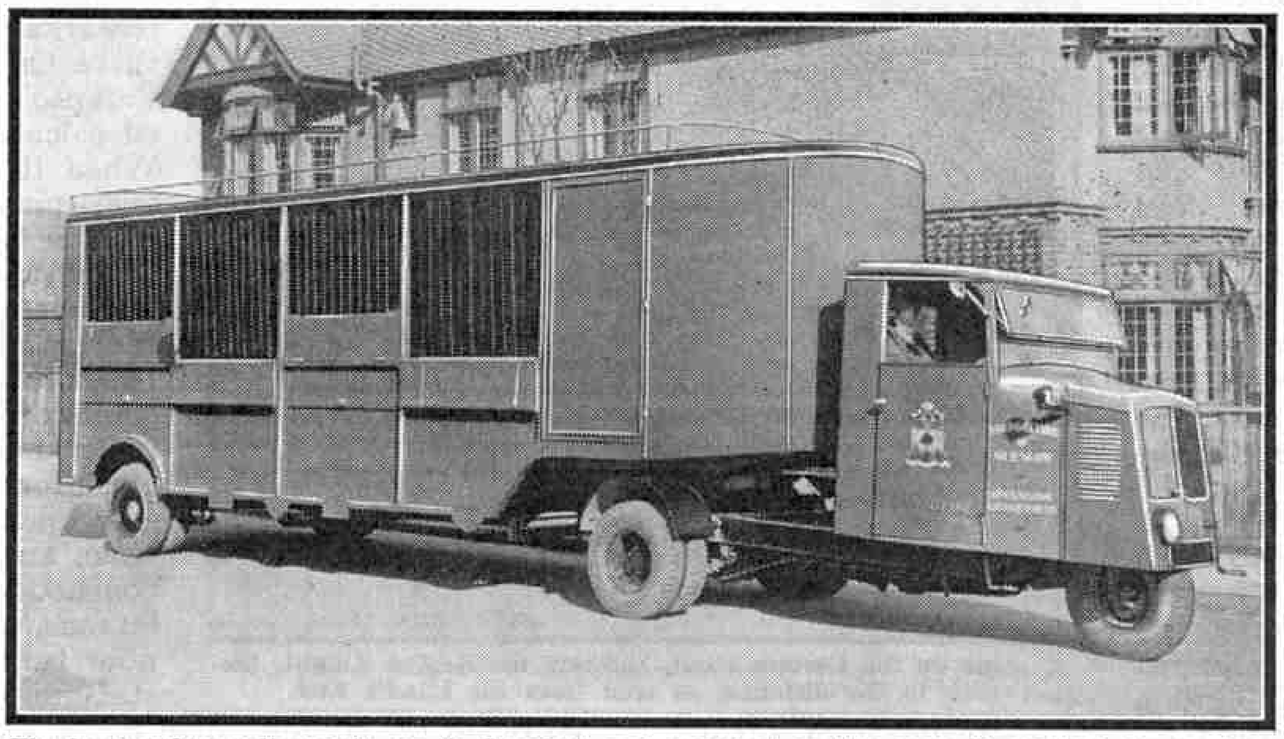


A new 17 h.p. Armstrong Siddeley limousine owned by Prince and Princess Arthur of Connaught, who are seen about to enter it. Photograph by courtesy of Armstrong Siddeley Motors Ltd., Coventry.

An Interesting Refuse Collecting Vehicle

The lower illustration on this page shows a huge semi-trailer refuse collector owned by the Glasgow Corporation. Its principal feature is a special Carrimore hopper body that has a capacity of 18 cu. yds. The trailer is coupled up to a Karrier Mechanical Horse tractive unit, which can be detached if desired and used with other vehicles and for other duties.

The main compartment of the trailer body is divided by a partition and each half is loaded through side openings screened by curtains made of strip rubber. An ingenious arrangement enables refuse to be discharged through trap doors in the bottom of the vehicle that are operated by winding a handle at the side. Receiving hoppers are provided at the discharge point, and the vehicle is driven over these on a runway.



The huge refuse collector in use in Glasgow, and described on this page. Photograph by courtesy of Carrimore Six Wheelers Ltd., London.

Rubber Company's 250 Million Motor Tyres

The Goodyear Tyre and Rubber Company at Akron, in the United States, recently completed its 250 millionth tyre. In making this immense number of tyres about 1,200,000,000 lb. of cotton and 2,750,000,000 lb. of crude rubber were used.

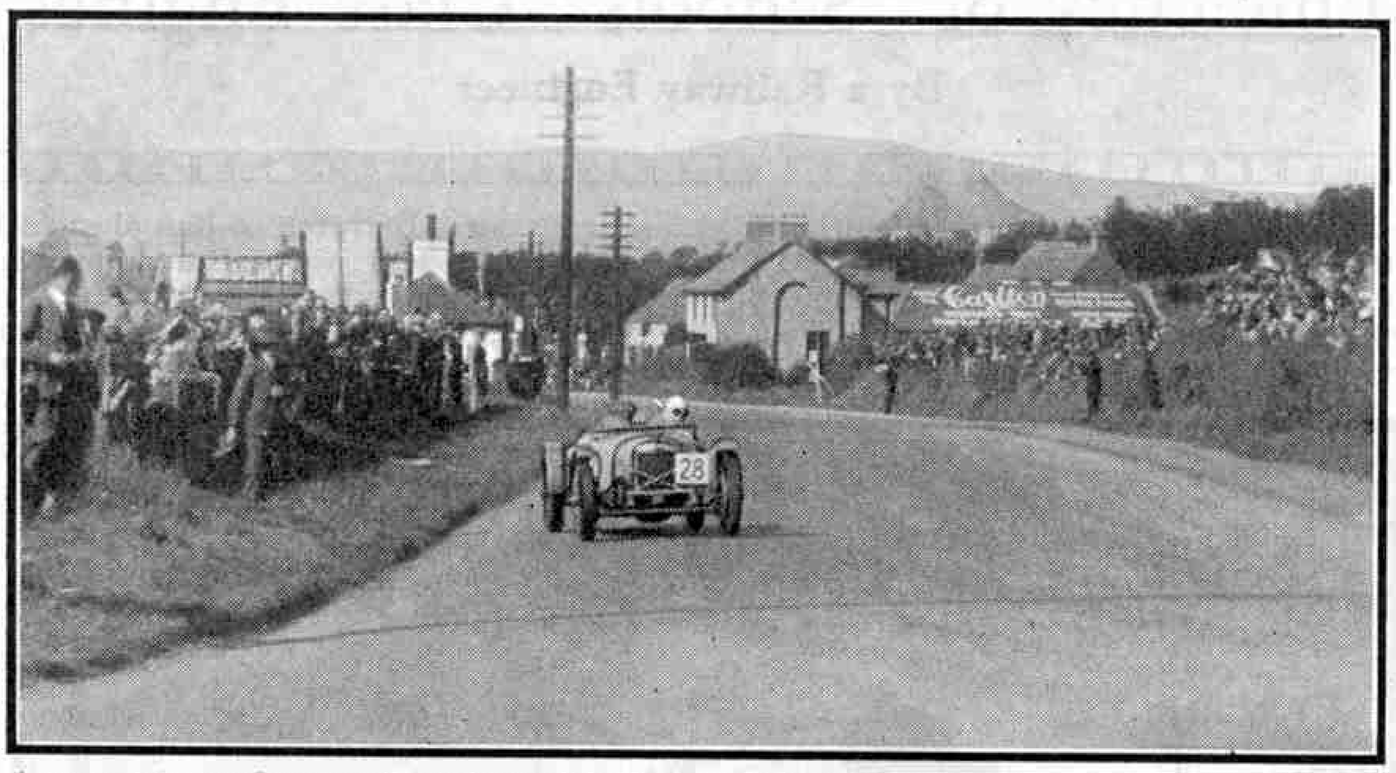
If all the tyres produced by the Company up to that time had been built up into a pile, they would have reached a height of 17,750 miles. Laid side by side they would have encircled the globe 4½ times, or would have extended nearly halfway to the Moon, and packed in railway wagons they would have made up a train

nearly twice as long as the British Isles.

It is even more interesting to realise how much running capacity these 250 million tyres represent. If a single motorist, travelling an average distance of 10,000 miles a year, tried to wear them all out, he would find himself faced with a task that would last 75 million years, and in that time he would have to cover more than the distance involved in making 60,000 trips to the Moon and back again!

An Old Type Racer's Success

A new challenger for British and Continental motor racing honours has arisen in the form of an old Delage owned and driven by R. J. B. Seaman. This is one of the finest racing cars ever built. Its main features are of 10-year old design, for it was constructed under the Grand Prix formula of 1926, but at the Derby and District Club's meeting early this year it beat a field that included several of the modern E.R.A. machines, which have achieved such a great reputation.



A scene at Quarry Corner on the Ards circuit in Northern Ireland during the R.A.C. Tourist Trophy Race last year, showing a competitor swinging out wide to take the corner. Photograph by courtesy of Riley Record Ltd.

As though to prove that this success was no mere flash in the pan the Delage next won in handsome style the newly organised R.A.C. Isle of Man Race on 28th May, in which 19 cars competed. At one period it seemed that this race would result in a victory for Earl Howe's E.R.A., which held a good lead in the early stages. The Delage took the lead on the fifth lap, however, and held it until the end. Earl Howe's car had to retire halfway through the race owing to a fractured petrol tank, and from then onward the struggle was between the Delage and other E.R.A.'s driven by "B. Bira" and C. Paul, who finished second and third respectively. The average speed of the Delage was 69.76 m.p.h.

At the Nürburg Ring

Following its success in the Isle of Man the Delage was taken to southern Germany, where it took part in the famous Eifel Races, which are run over the mountainous Nürburg course, which has been described as the most wonderful in the world. On this occasion it had to retire early in the race owing to a crumpled oil tank and other damaged parts.

The chief events of the Eifel Races, so far as British cars were concerned were the international races for racing cars of 1,500 c.c. and 800 c.c. capacity, and sports cars, all of which started together, but competed in separate classes according to their capacity and whether they were supercharged or not.

Last year the 1,500 c.c. event was won by an E.R.A. driven by R. Mays. Four E.R.A. machines were entered this year, including one driven by the winner in 1935. Mays was soon in difficulty, however, and had to make a call at the pits owing to plug trouble. At that time another E.R.A. driven by "B. Bira" was holding second place to a Maserati driven by Count Trossi, but before the half-way stage was reached the British car had dropped to third, second place being taken by Tenni, who also was driving a Maserati, and these positions were held to the finish. Towards the end of the race Mays drove in furious fashion in a bold endeavour to make up lost time, but his efforts were unsuccessful. Trossi won the race with an average speed of 69.9 m.p.h., Tenni was second and "B. Bira" third.

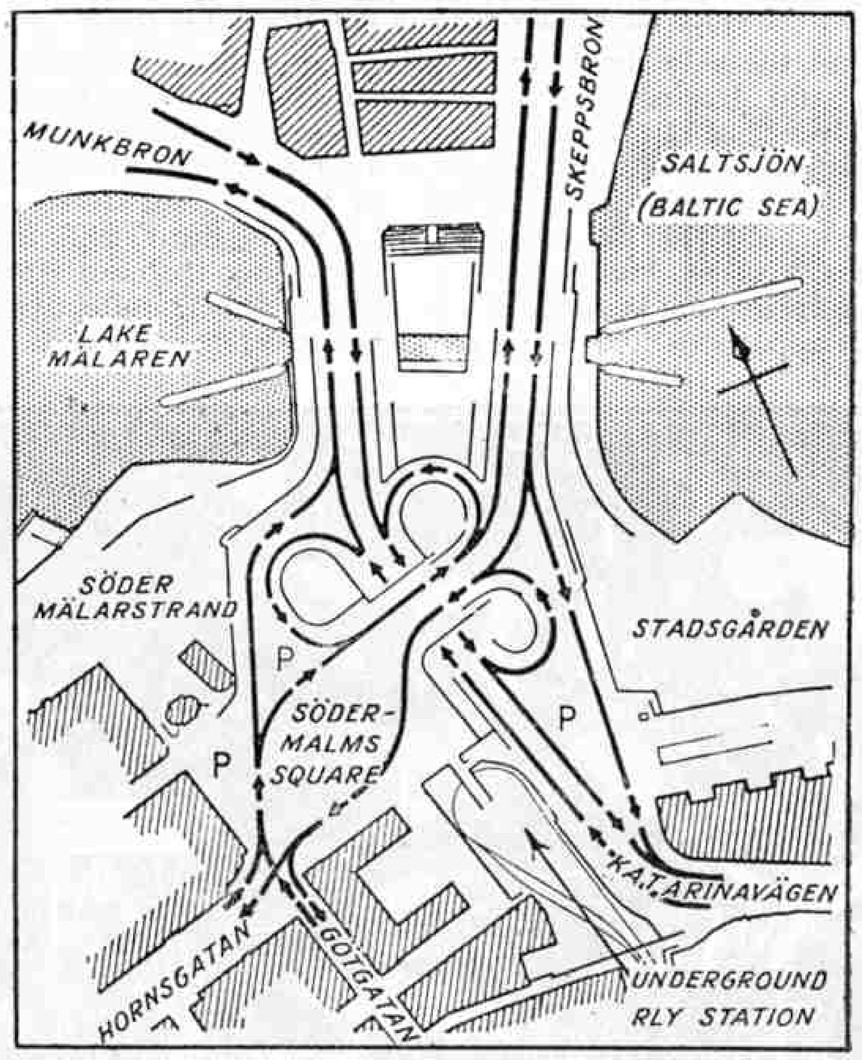
The chief event of the day was the race for large cars such as Mercedes-Benz, Auto-Union and Alfa-Romeo. Among the many famous drivers who competed were Rosemeyer, Nuvolari, Stuck, Chiron and Brauchitsch. The latter driver holds the lap record for the Nürburg Ring with a speed of 80.73 m.p.h. set up during the German Grand Prix last year. No great speeds were set up in this year's event owing to bad weather, and the race was won by an Auto-Union driven by Rosemeyer. Nuvolari and Brivio, both driving Alfa-Romeos, were second and third respectively.

A Sweeping Victory for the E.R.A.

E.R.A. cars demonstrated their capabilities in a convincing manner by securing the first three places in the Picardy Grand Prix. In this race, which comprised two heats and a final, seven E.R.A. cars competed against Maseratis, Amilcars, Bugattis, several Salmsons and Seaman's Delage. In the first heat there was a terrific duel between an E.R.A. driven by P. Fairfield and a Maserati driven by Count Trossi, first one and then the other of these two gaining the lead. Trossi finally overhauled Fairfield, however, and went on to win comfortably, while "B. Bira" was third.

In the second heat an E.R.A. driven by R. Mays took the lead, but unfortunately had to retire with a broken oil pipe. Seaman, who in his Delage was following closely behind, immediately flashed into the first place, which he succeeded in retaining until the finish. E.R.A. cars driven by Earl Howe and Tongue were second and third respectively.

In the final the steering gear of Seaman's Delage went wrong during the fifth lap, and the car went over a heap of stones and dashed into a wall, but was not very badly damaged. At that time Fairfield's E.R.A. was in the lead, but struck a bank at one of the last bends. Fairfield was uninjured, but the accident cost him the race, for "B. Bira" immediately shot into the lead and held it to the end. Fairfield was second, half-a-minute behind the winner, Earl Howe was third and F. McEvoy, who drove a Maserati, finished fourth.



A diagram of a novel clover leaf road junction in Stockholm that is described on the opposite page. For this illustration we are indebted to the courtesy of "Modern Transport."

The French Grand Prix

This year's French Grand Prix, run on 28th June at Montlhéry, resolved itself into a struggle between three new streamlined Bugattis and nine Delahayes. The winner was J. P. Wimille, who drove a Bugatti and covered the distance, about 620 miles, in 7 hrs. 58 min. at an average speed of 77.85 m.p.h. Delahayes driven by M. Paris and R. Brunet were second and third respectively.

The record for the lap was broken eight times during the race and a Talbot car set up the final figure of 83.68 m.p.h. Three Riley cars driven by J. Trevoux, A. von der Becke and C. Paul were placed first, second and third in the group for cars of two litres capacity.

Racing Thrills in Store

Everyone interested in motor racing is now looking forward to the R.A.C. Tourist Trophy Race, which will take place over the Ards Circuit near Belfast on 5th September. This race never fails to provide exciting incidents and thrills in plenty for the great crowds of spectators that invariably line the course.

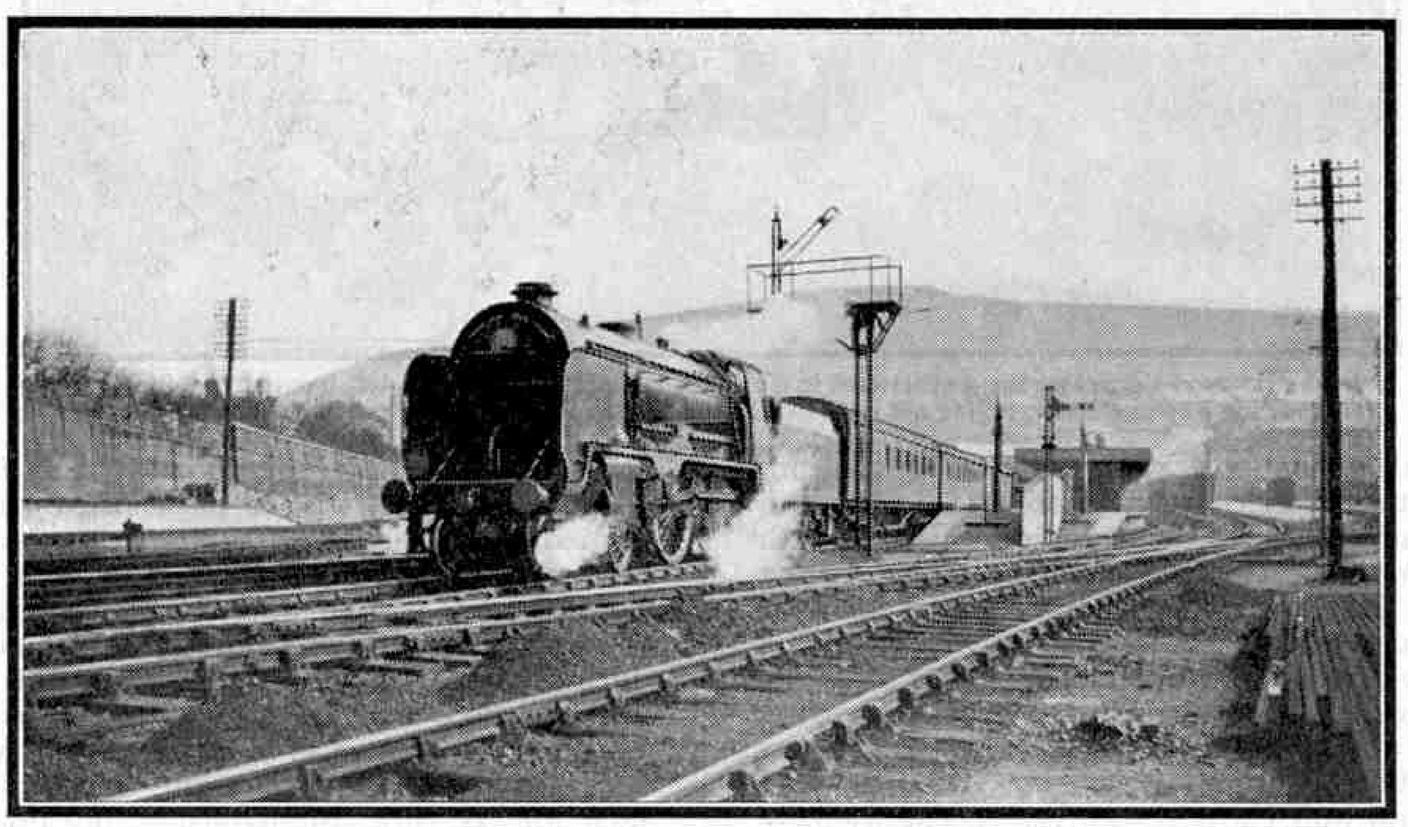
The Ards Circuit is used for the R.A.C. Tourist Trophy Race only, and consists of 13 2/3 miles of well-surfaced roads with many corners that give drivers opportunities of showing their skill. Last year the Trophy was won by F. W. Dixon's 1½ litre Riley, which covered the course at an average speed of 76.9 m.p.h. This is the second highest speed in the history of the race, the record being the 80.53 m.p.h. set up by Earl Howe in 1932 in a supercharged Alfa-Romeo, and Dixon's speed is the highest reached by a winning car not fitted with a supercharger Earl Howe's record speed was almost equalled last year by an unsupercharged car, E. R. Hall's Bentley achieving 80.36 m.p.h.

On the Footplate of a Southern Flyer

Efficiency of "Schools" Class Engines

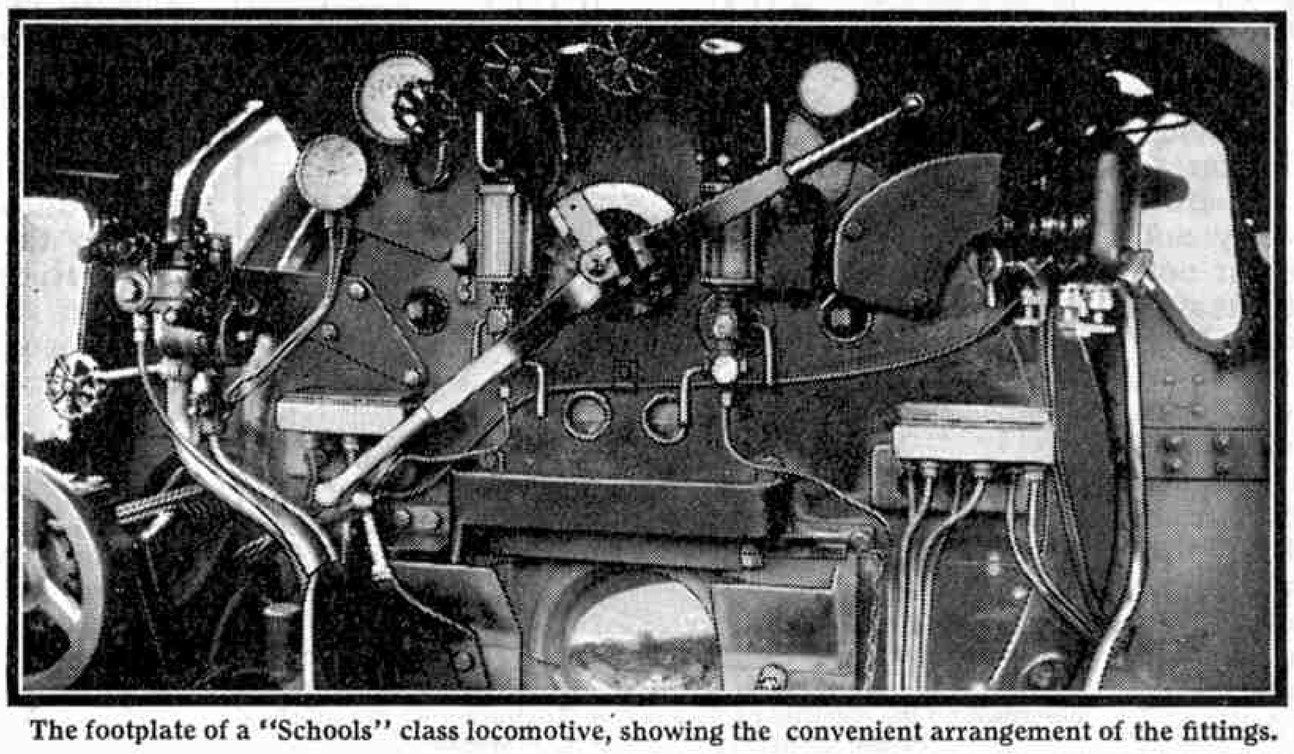
By a Railway Engineer

THE 80-minute London-Folkestone service of the Southern Railway represents the fastest group of trains in the country still regularly worked by 4–4–0 engines. Occasionally a "King Arthur" may be seen on one of these expresses, but otherwise they are almost invariably hauled by the "Schools" class 4–4–0s. These remarkable engines are the most powerful examples of the type that have yet been built, and with three cylinders 16½ in. diameter by 26 in. stroke, combined with a working pressure of 220 lb. per sq. in., they have a tractive effort almost equal to that of the six-coupled "King Arthurs." They were designed primarily for the Hastings line, which abounds in steep grades and sharp curves; but whether it be in the realm of heavy collar work or fast running on the level their performance is equally good.



Down Kent Coast Express leaving Priory Station, Dover. The engine is No. 916, "Whitgift," on the footplate of which the run described in this article was made.

In order to conform to loading gauge restrictions on the sharply curved lengths of the Hastings line, the cab, although wide and roomy, is rather short, and the side sheets are inclined inward; they are arranged for left-hand driving and the reversing gear is operated by a vertical wheel like that of the "Lord Nelsons." An interesting feature of the cab fittings is the lubricators. The coupled-wheel axle-boxes are fed from oil containers fixed on the backplate of the fire-box in the driver's cab, the oil being conveyed down the connecting pipes by means of worsted trimmings. In the right-hand corner of the cab is a three-feed Wakefield sight-feed lubricator for the cylinders. In this apparatus live steam is supplied to the oil chamber of the lubricator; this steam condenses, sinks to the bottom as water, and in so doing displaces a quantity of oil which feeds in drops through a vertical glass tube. The rate of feed can always be seen by the enginemen and thus regulated to suit conditions.



The footplate of a "Schools" class locomotive, showing the convenient arrangement of the fittings.

I was privileged to ride on the footplate of No. 916, *"Whitgift,"* while working the 12.55 p.m. express from Charing Cross, on which the load was one of eight corridor bogies and a Pullman car, 282 tons tare and 300 tons full. Driver Keel and Fireman Burgess of Ramsgate shed were in charge. Starting away very gently, we were barely across the Thames when cut-off was back to 20 per cent., and then, still running on arches after we had gained the Surrey side of the river, we were soon passing the impressive facade of Waterloo. As soon as we were past this point *"Whitgift"* was given full regulator. Running level with the roofs of dwellings and warehouses, and with the dome of St. Paul's and the spires of the City churches enobling the outlook northward, we accelerated rapidly until, nearing Borough Market Junction, one of the four-aspect colour-light signals showed us a single yellow. It quickly changed to green, but we were in any case easing a little for the sharply curved stretch of line ahead where the line from Cannon St. joins in, and where the railway almost brushes the side of Southwark Cathedral.

The London Bridge home signal showed green, indicating that at least three signal sections were clear, and Keel opened up to full regulator. As it was Saturday, the platforms were crowded with home-going City workers, electric trains were on all sides, and we went through the great station in fine style in a little under five minutes from Charing Cross, 1.9 miles. Once through the platforms the line becomes dead straight, the signal lights show up literally for miles, even in bright sunshine, and ahead of us three successive signals showed double yellow, single yellow, and red. Whistling shrilly, we were up to the single yellow and preparing to stop when the red changed to green, and then we were "right away" indeed. This is an amazing piece of line; no less than eleven parallel tracks run into London Bridge; on both sides of the railway there stretches a veritable sea of house-tops; while to the north the line of the River is marked by the Tower Bridge and farther eastward by the masts of ships lying in the London docks.

On the dead level, cut-off was brought back to 18 per cent., and we swung through New Cross at 52 m.p.h.; but just beyond here begins the 11-mile climb over the North Downs. Without securing the reversing wheel in any fixed position, the driver very gradually increased the cut-off; at Grove Park where the gradient steepens to 1 in 120 it was up to 27 per cent., and as we approached Elmstead Woods tunnel a final increase to 29 per cent. was made. Here speed was a steady 38½ m.p.h. The check at London Bridge had cost us a minute, but this was being gradually won back. Just beyond the tunnel the grade eases a little, and the driver took advantage of this to notch up to 20 per cent.; Orpington was passed at 49 m.p.h., and so we came on to the last stage of the climb, again at 1 in 120. Through deep cuttings where the banks are almost vertical walls of grey-white chalk, through Chelsfield tunnel, *"Whitgift"* responded finely to a gradually increased cut-off and came over Knockholt summit at 45½ m.p.h. The 16.6 miles from Charing Cross had taken 25¾ minutes, and throughout the 11 miles of ascent speed had averaged 44.7 m.p.h.—a very fine achievement considering that for only three miles of the distance cut-off was as much as 29 per cent.

Just beyond Knockholt we entered the long tunnel under Polhill. The engine was worked with the fire-doors closed except when firing was in progress, and in the tunnel we were in pitch darkness on the footplate; in the meantime the driver had changed over to the

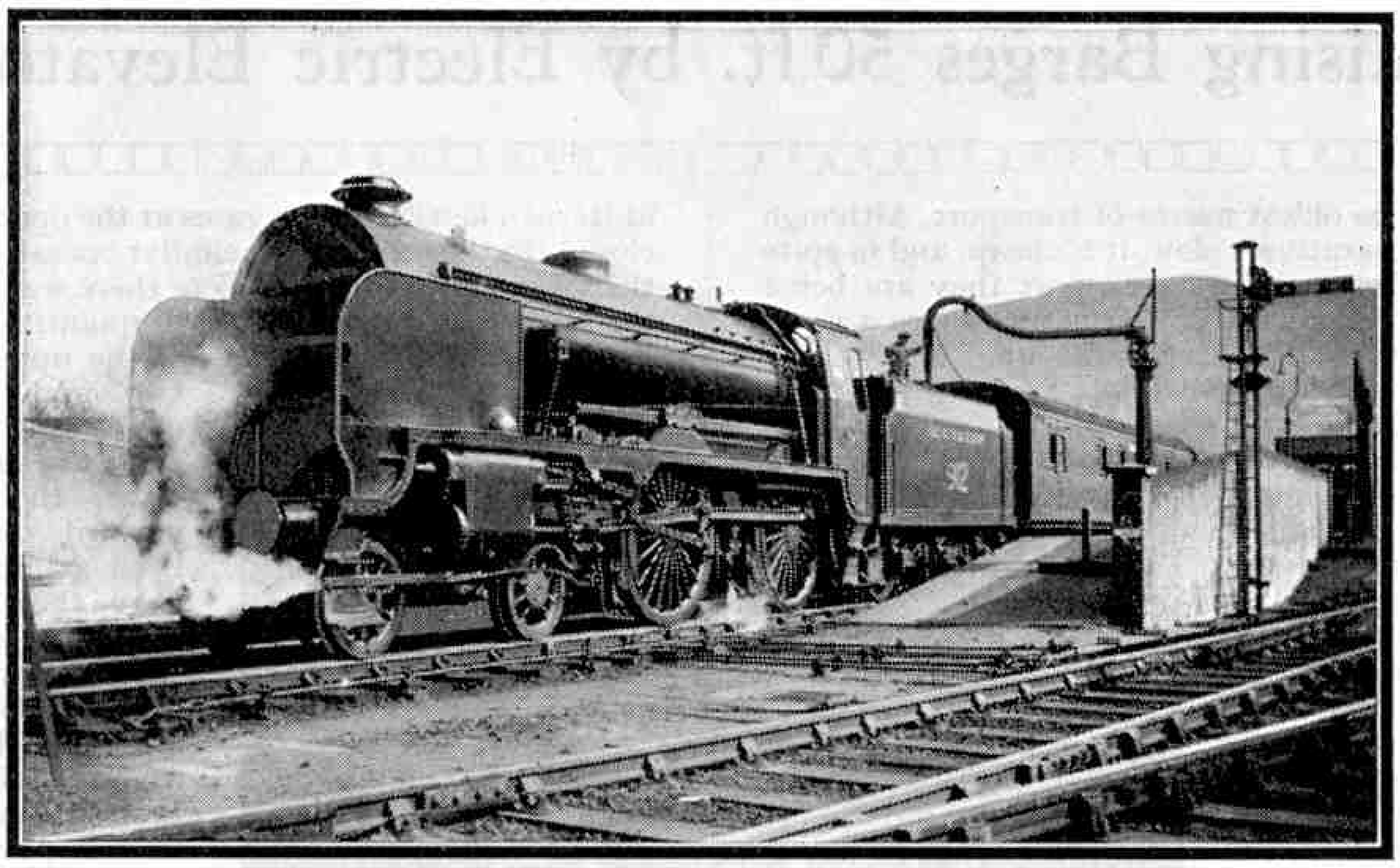
first valve of the regulator and cut-off was reduced to 18 per cent. We left the tunnel at 65 m.p.h., and running beneath the beautiful chalk escarpments of Polhill swept down to the valley of the Darent. Dunton Green was passed at 72½ m.p.h., but Driver Keel never let the cut-off remain in one position for long, and increasing to 22 per cent. we took the 2-mile rise at 1 in 160 to Sevenoaks flying, at a minimum speed of exactly 60 m.p.h. We were now dead on time, having covered the 22.1 miles from Charing Cross in 31 minutes.

At the entrance to the long tunnel under the southern ridge of the North Downs the descent to Tonbridge begins; cut-off was brought back to 17 per cent. and even the first valve of the regulator was practically closed. Speed steadily rose all through the tunnel, and at Weald signal box, half a mile beyond the south end, we were doing 69 m.p.h.; here the first regulator was opened to the full. The response of the engine to this modest increase was amazing—in less than three miles we were up to 78 m.p.h.! The hills were now left behind, we were down among the level meadows of the Weald of Kent; and approaching the River Medway steam was shut off and the brakes applied for Tonbridge curve. On this first descent "*Whitgift*" proved herself to be without question the smoothest riding engine I have ever travelled on, and at 75 m.p.h. my notes, even when made standing, were as steady as if written in a room; the driver told me that when she first came out of the shops she rode more like a limousine than a locomotive.

Not a second was wasted over the slack; speed was carefully reduced to the prescribed figure round the curve, but the instant the engine was over the junction the regulator was opened again so as to take full advantage of the quarter mile down at 1 in 670 before the rise to Mile Post 31 began. Rapidly accelerating, we passed Tonbridge station, 29½ miles in 38 minutes. Beyond here the character of the line changes entirely; the sharply graded switchback of the route through the Downs gives place to a gently undulating road with no grade steeper than 1 in 240. Hop fields extend on both sides of the line, and many miles to the north the long green ridge of the Downs runs parallel with the railway; but perhaps the most unusual feature of this length is that from Tonbridge almost to Ashford the line is practically dead straight.

We were quickly up the rise from Tonbridge, and the driver then changed over once more from the main to the first regulator; but even on these gentle ups and downs cut-off was constantly varied between the narrow limits of 18 and 24 per cent., to suit every change in the grade. We maintained a beautifully even pace. Paddock Wood was passed at 71 m.p.h., 65 was maintained over the rise past Marden, and at Staplehurst we were doing 69 m.p.h. on the dead level. Approaching Headcorn, Driver Keel changed over to the main regulator, but only just half open, in readiness for the 8-mile rise to Chart Siding. On the final length, where the grade is 1 in 277, speed did not fall below 63 m.p.h., and a moment later we were approaching Ashford at 71 m.p.h.

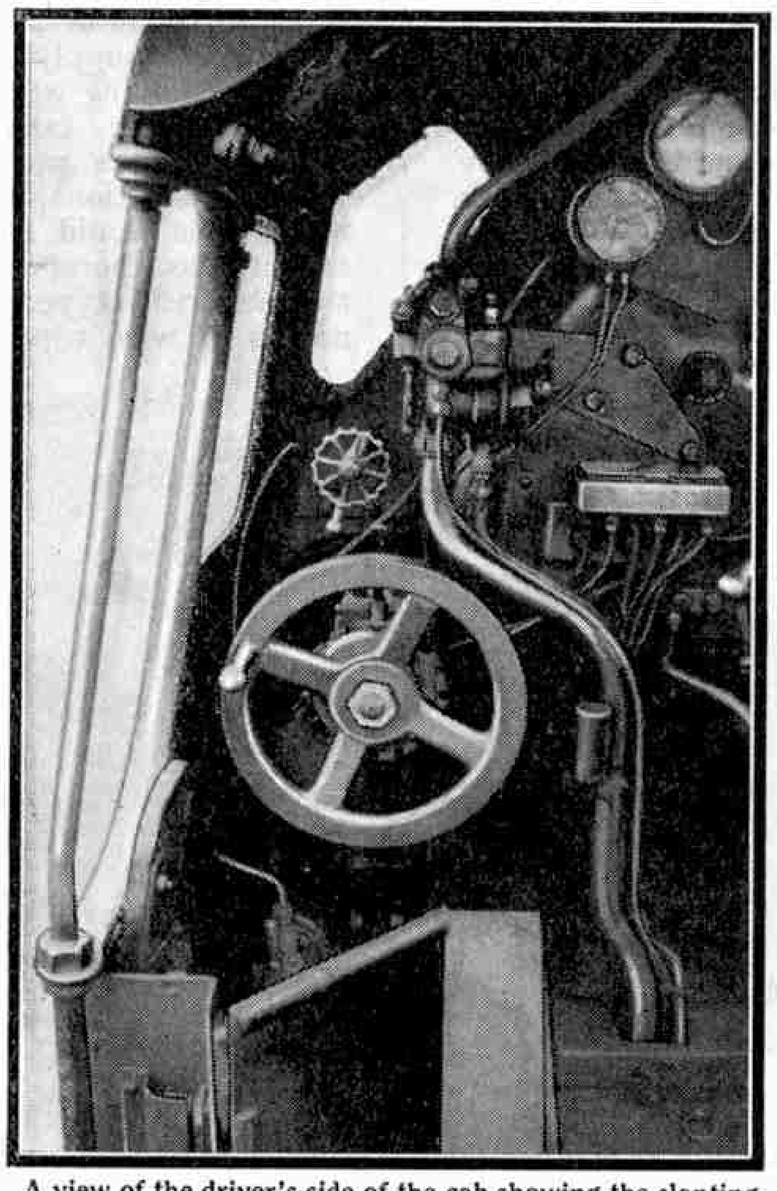
There was a very severe permanent way slack in store for us beyond Smeeth, and the driver was wisely getting some time in hand. We passed Ashford, 56.1 miles from Charing Cross, in 62½ minutes, 2½ minutes early, and our average speed over the 26.6 miles from Tonbridge was 65.2 m.p.h. Considering the very moderate regulator opening that had been used, this was a very striking figure with a 300 ton load, for taken on the whole this length is decidedly against the collar. The relaying slack was in force right in the middle of the long 1 in 266 ascent to Westenhanger. For over half a mile we crawled along, and although Keel subsequently gave the engine 33 per cent. cut-off and opened the main regulator to three-fifths, we were doing barely 40 m.p.h. on topping the summit where speed rarely falls below 55 m.p.h. in the ordinary way.



No. 912, "Downside," of the "Schools" class, taking up water at Dover.

Grey chalky downs rose ahead, the Western flanks of the most famous cliffs in England; we passed Sandling Junction, practically on time despite the check, and "*Whitgift*" was once again working on the first regulator. Accelerating rapidly on the 1 in 266 descent, we emerged from the long tunnel beyond Sandling at just over 60, touched 66 before Shorncliffe, and in 80 minutes almost to the second drew up at Folkestone Central. The net time for the 69.9 miles from Charing Cross was not more than 75½ minutes, however, and thus the average speed of 55.8 m.p.h. was maintained.

At Folkestone four coaches were detached, leaving a load of 170 tons to go forward; this of course provided a very simple task for the engine, but even so the journey worked up to a glorious climax. Ahead of us lay a magnificent range of chalk cliffs, those white walls that for centuries have stood as a symbol of England herself; and through these formidable bastions that great engineer Sir William Cubitt carried the line to Dover by one of the most daring pieces of railway engineering in the British Isles. Just after leaving Folkestone Central the line is carried high above the town on the stately Foord Viaduct, from which there is almost a bird's-eye view of picturesque old houses tier upon tier, of narrow streets winding down to the sea, and out beyond a glimpse of the harbour and cross-channel steamers.



A view of the driver's side of the cab showing the slanting side. The reversing wheel and brake valve are clearly visible.

Rapidly accelerating we sped through Folkestone Junction, whence the boat trains run down to the harbour, and a moment later entered Martello Tunnel; this of course takes its name from the famous towers, one of which stands on the cliff above. We emerged into Folkestone warren, a wild and lovely tract of land between the cliffs and the shore. On through deep cuttings with only an occasional glimpse of the sea; cliffs towering higher and higher above us on the left; then, with speed now up to 60 m.p.h., we dived under the great headland of Abbots Cliff, through the longest of the many tunnels on this route. It is dead straight, and right ahead was a tiny pin-point of light. Half way through the regulator was closed, and coasting freely we emerged on a high ledge with the sea right beneath; mist hung over the Channel and the breaking waves were of a green as brilliant as verdigris.

Shakespeare's Cliff now lay ahead, through which the line is carried by two single-line tunnels of a most curious pointed shape. Almost before there was time to appreciate the full beauty of the cliff scenery we were into the tunnel and slowing up for Dover. We came out in full view of the Admiralty Pier, and running abreast of the locomotive sheds crept over Archcliffe Junction at 10 m.p.h.; then swinging right round away from the sea there was just time for some fascinating glimpses of the harbour, the castle, and the cliffs of the South Foreland, before we entered Hawkesbury St. tunnel. This extends for half a mile under the chalk downs, and we emerged at the Priory station, as at Folkestone, dead on time; the 77.3 miles from London had taken 95 minutes. This run is typical of the fine locomotive work that is being done year in year out on these expresses, and it shows off well the efficiency of the "Schools" class engines.

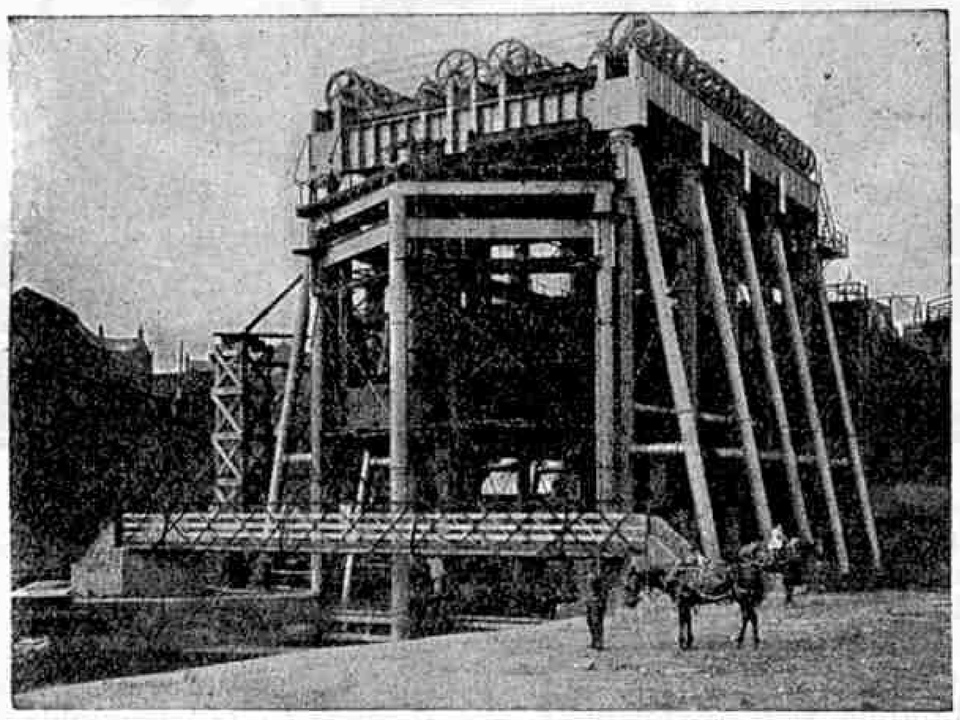
A Notable British Canal Lift

Raising Barges 50 ft. by Electric Elevator

CANALS provide one of the oldest means of transport. Although traffic along them is comparatively slow, it is cheap, and in spite of the advantages of speedier means of transport they are being more extensively employed, especially in Germany, where a great national system of waterways has been built up.

Perhaps the greatest of the difficulties that the builders of canals have to contend with is that of linking up sections at various levels, or providing access to other waterways in similar conditions. Unlike a railway, a canal cannot be constructed at any point with a gradient, however slight, and locks therefore have to be built in order to enable barges to pass from one level to another. This is inconvenient when the height to which vessels have to be raised is large, for long and expensive flights of locks then have to be erected and the passage through them takes up valuable time.

This difficulty can be overcome by using a lift instead of a series of locks. The first lifts were hydraulic in action. Barges at both the higher and lower levels ran into tanks or troughs supported on rams that were moved by water pressure. The tanks were balanced, and the lower one could be made lighter by taking out some of the water. The upper and heavier tank then descended and the lower one was raised.



The Anderton Boat Lift after its reconstruction as an electric lift. We are indebted to the Weaver Navigation Trust for the illustrations to this article.

More recently canal lifts that are operated electrically have been introduced. In these tanks to hold one or more barges are suspended from ropes or cables passing over pulleys and are lifted by means of electric motors. Watertight gates at the ends of the tank enable barges to pass in or out. A famous lift of this kind is that at Niederfinow, in Germany, which was described and illustrated in the "*M.M.*" for December, 1934.

There is a particularly interesting example of a canal lift at Anderton, in Cheshire. This forms part of the Weaver Navigation System in Cheshire, and actually is more than 60 years old. For the first 30 years or so of its existence it was a hydraulic lift. It was then rebuilt as an electric lift, and has since given many years of excellent service. It connects the River Weaver with the Trent and Mersey Canal. The latter is 50 ft. 4 in. above the river, and before the lift was constructed there was much loss of time in the expensive process of transhipping goods from barges in the one waterway to similar vessels in the other.

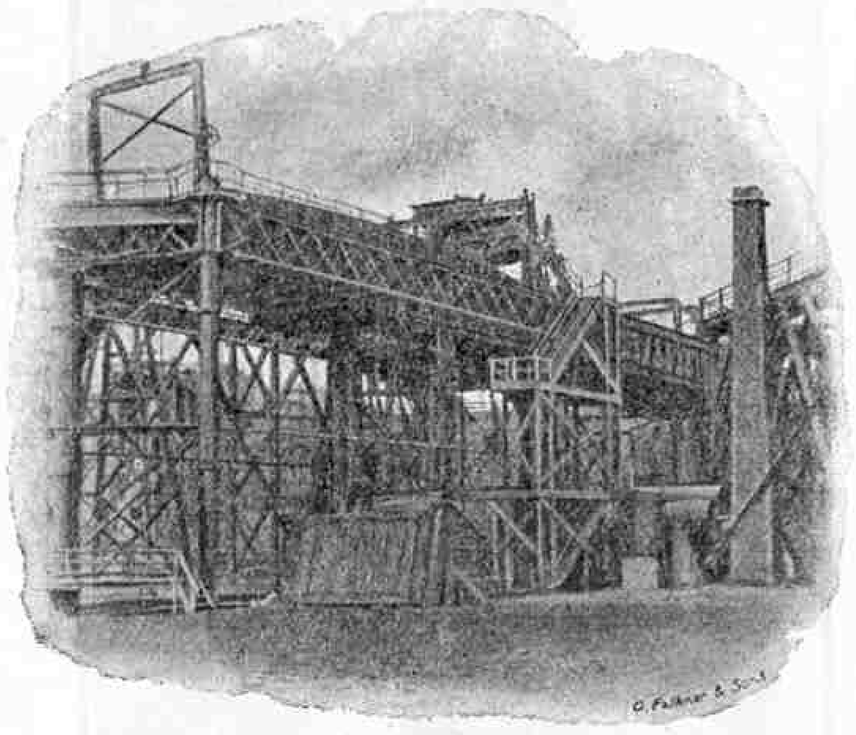
The lift was opened in 1875. It is situated on an island in the basin of the river and for this reason it was necessary to build an aqueduct to carry the canal over the river to the point where the transfer of barges was to be effected. This aqueduct is 162 ft. 6 in. in length. It is built in three spans and a central web divides it into two channels, each 17 ft. 2 in. wide, that form the approaches to the two tanks of the lift itself.

The two tanks or caissons originally were supported on rams 3 ft. in diameter working in the cylinders of hydraulic presses communicating with each other through valves. They are of wrought iron, and are 75 ft. long and 15 ft. 6 in. wide. When the lift was operated by water pressure, one tank was always at the level of the canal and one at that of the river, except of course during the actual lifts, when they passed each other. A barge to be transferred from the canal to the river was floated into the tank at its own level, and the gates at the open end of the tank were then closed. In the meantime a similar operation was being carried out at the lower tank, if barges were there waiting to be transferred from the river to the canal. A small quantity of water was then drawn from the lower tank. This left the upper tank the heavier of the two and on opening the valves connecting the presses in which the rams worked, this tank moved downward, the lighter one being raised upward until the new levels had been attained. The watertight doors were then opened and the barges proceeded on their way.

Each tank when full of water weighed 252 tons, and only a slight difference in weight was necessary to bring about the change of level. It is calculated that about 5/6th of the power required for transfer were due to it, and the rest was obtained from a small hydraulic accumulator, with a ram 1 ft. 9 in. in diameter, that was used to assist in working the lifts.

In this form the structure remained in use for about 20 years, when corrosion and scoring of the rams made it necessary to replace the canal water previously used in the cylinders of the hydraulic system by condensed water. A small dynamo and battery were installed at the same time in order to supply light and power for warehouses and cranes on the adjoining wharves, and this also supplied power for raising the gates of the tanks and the aqueduct.

Early in the present century it became necessary to make several alterations to the lift, including the renewal of the main rams. This would have caused a lengthy interruption to traffic and it was therefore decided to transform the lift into one of the electrical type. Each tank therefore is now suspended by means of wire ropes passing round overhead pulleys. Counterweights consisting of 252 tons of cast iron hang from the free ends of the ropes, so that comparatively little power is needed to raise a tank, although the total weight moved, including the pulley wheels, is about 570 tons. This power is supplied by an electric motor of 30 h.p., and is applied directly to the pulleys over which the ropes pass.



The Anderton lift in its original form, when it was hydraulic in action.

The whole of the alterations were carried out with only three short stoppages, each lasting a fortnight. The work was completed in May 1907, and it not only reduced the cost of operation, but also speeded up the transference of barges from one waterway to the other. The lift is still working satisfactorily, after a period of operation in its new form of more than 31 years.

It is interesting to compare this veteran British canal lift with the one at Niederfinow to which reference has already been made. The Niederfinow canal lift was opened in March 1934 and is the largest in the world. It is designed to deal with barges up to 1,000 tons in displacement and lifts these to a height of 116 ft. in five minutes. The length of its giant steel trough is 278 ft., or nearly four times that of each of the tanks of the Anderton lift, and its width is 40 ft., the depth of water in it being 8 ft. 3 in. The total weight of this enormous structure is nearly 4,200 tons. Great blocks of concrete about 24 ft. long form the counterweights, but four 75 h.p. motors are sufficiently powerful to raise the huge mass, although the total weight moved is more than 8,000 tons.

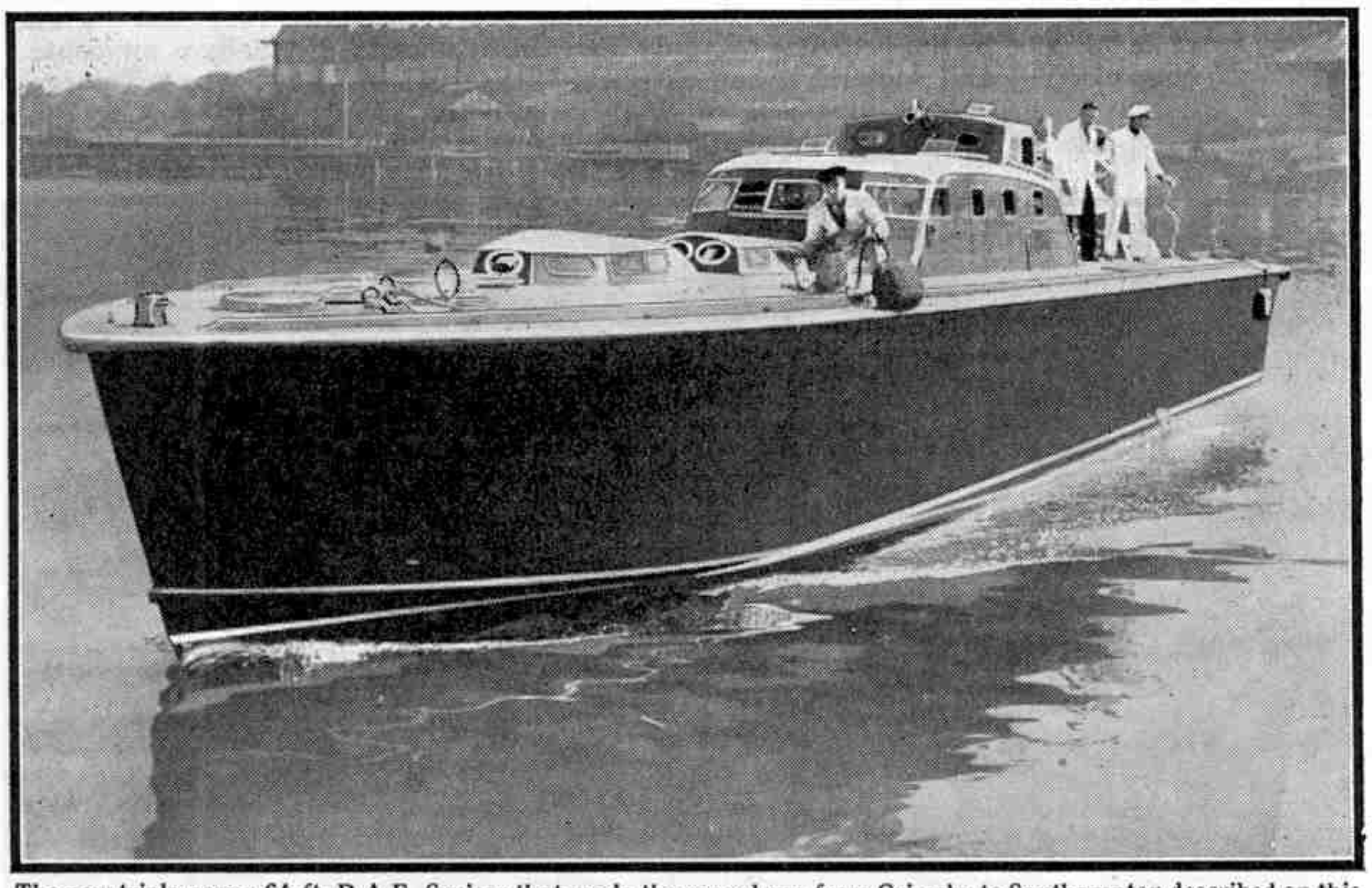
Motor Boat's Record Run

Grimsby to Southampton at Over 36 Miles Per Hour

A TRIPLE-SCREW motor lifeboat cruiser built for the R.A.F. by the British Power Boat Co., of Hythe, Southampton, to the design of Mr. Hubert Scott-Paine recently accomplished one of the most remarkable voyages ever made by a motor vessel. This cruiser is 64 ft. long, with a draught of a little more than 3 ft. She has a designed speed of 35 knots, or about 40 m.p.h., and at this speed she can cover a distance of 500 miles without refuelling. At about 24 knots the range is some 800 miles.

The new boat is intended for rescue work in the event of aeroplanes with wheeled undercarriages being forced down at sea. Her high speed makes her particularly suitable for work of this kind, and she is well equipped for her task. Accommodation is provided for a crew of eight, and there is also a hospital bay for four stretcher cases, in addition to a wheelhouse, a chartroom and a wireless cabin.

Three "Power-Napier" Sea Lion engines are fitted in the vessel. These are based on the Napier Lion aero engine, which has been modified and adapted for marine work by the British Power Boat Co. Each engine develops about 500 b.h.p. at about 2,000 r.p.m., though it is believed that they are capable of working up to considerably higher power.



The new triple-screw 64-ft. R.A.F. Cruiser that made the record run from Grimsby to Southampton described on this page. The average speed over this distance of 373 miles was more than 36.2 m.p.h. Our photograph is reproduced by courtesy of The British Power Boat Co., Southampton.

The cruiser was taken on a trial run of well over 700 miles from Southampton to Grimsby and back round the south-east coast. The outward journey occupied a little more than 14 hrs. It was not easy running from the South Foreland up the east coast, and really heavy weather was encountered going across from Cromer to Spurn Head. Across the Wash the vessel was driven hard through confused seas by Mr. Scott-Paine, who was at the helm practically throughout the run.

The behaviour of the boat was so satisfactory on the outward trip that her designer decided to go all out for a record on the return trip. This attempt was remarkably successful, for the voyage of 373 miles from Grimsby to Southampton was completed in an actual travelling time of 10 hrs. 14 min. at an average speed of more than 36.2 m.p.h. This is probably the most remarkable performance ever put up by a motor craft of comparable size and speed.

It had been intended to make the return trip on Monday, 25th May, but owing to fog and cold sleeting rain the start was postponed until the following day. Tuesday turned out to be cold, with an overclouded sky, and visibility was only about six miles, but at 9 a.m. the engines were set in motion, and within 20 minutes the boat had left its mooring berth in Grimsby Inner Dock, passed through the lock and was in the Harbour. The actual voyage commenced at 9.30 a.m. With all three engines full out, a speed of about 30 knots was maintained, and Haille Sands buoy was passed in 18 minutes. A heavy swell was encountered outside the Wash, with occasional patches of severe broken water, and conditions became more and more difficult, visibility being reduced first to about two miles, and later to only a mile. In spite of this and of the high speed, the journey across the Wash was made without discomfort.

Cromer was sighted abeam at 11.43 a.m., and conditions then improved slightly. The sea became smoother, and the waves, from 4 ft. to 5½ ft. in height, lengthened considerably. At 12.15 p.m. the engines were stopped for five minutes to enable accurate petrol readings to be taken, a task that was undertaken every three hours. Up to that time the average speed had been more than 30 knots, or 34.5 m.p.h.

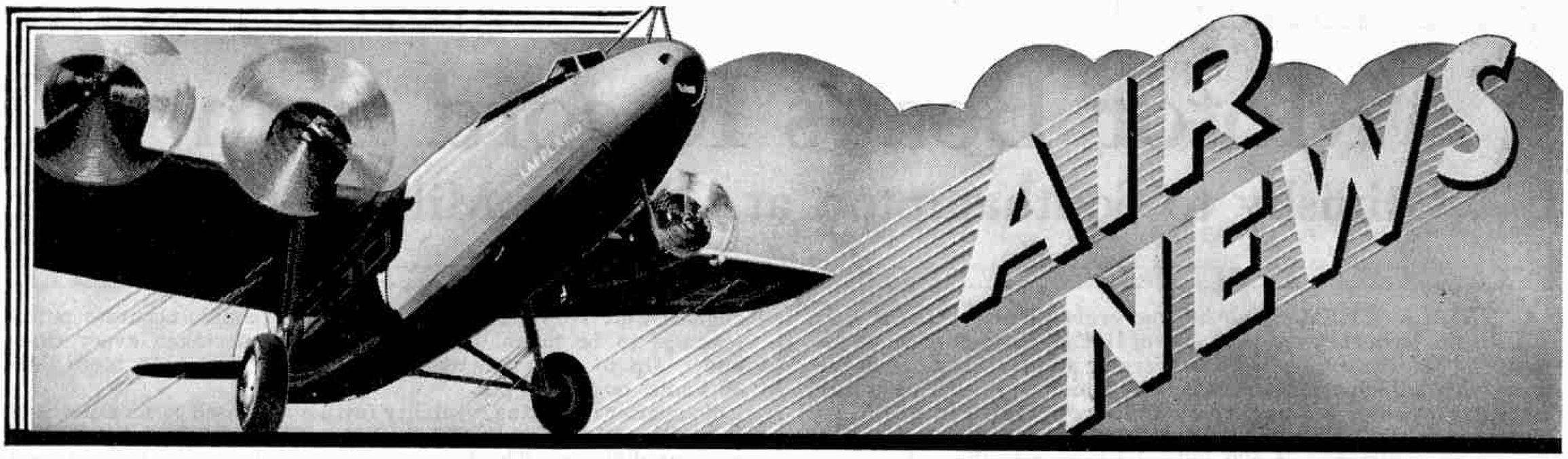
Soon after restarting, visibility further increased to six miles, and the boat passed Yarmouth at 12.44 p.m. riding the smooth swell without difficulty. The fog was gradually becoming thinner, and finally at Orford Ness at 2.8 p.m. the Sun broke through for the first time that day, only to be blotted out again by the time the Sunk Light Vessel was reached. Visibility now improved to 10 miles, however. The waves shortened and became choppy, and about 30 minutes later, when passing the Kentish Knock Light Vessel, quite a sea was working again. Speed had increased, and at this part of the course the average was more than 34 knots. At 3.15 p.m. a stop was made for the second of the three-hourly petrol soundings.

A few minutes after restarting, the vessel ran into heavy seas, which were white capped as far as could be seen. The North Foreland was passed at 3.21 p.m., and the Brake Light Vessel and the South Foreland were sighted abeam some 23 and 33 minutes later, respectively. The sea continued to be very heavy and, backed by a strong wind, was making it hard going for the shipping in the vicinity. Off Dover at 4.0 p.m. in the heaviest sea yet encountered, the cross-Channel steamer was seen throwing the waves rail high. Conditions eased a little after passing Dover Point, and at 4.11 p.m. Folkestone was sighted abeam. Off Dungeness the sea became quite as bad as at Dover, though going was easier as the waves had lengthened.

The clouds were now rapidly disappearing, and by 4.45 the sun was shining strongly, the overcast sky having been replaced by one of shimmering blue, rendering visibility excellent. The boat made a fine picture as she drove through the heavy sea, for the spray thrown up on each side sparkled in the sunlight, and the long pure-white wash left in her wake looked like a street of dazzling snow. The sea continued to be heavy and broken, and Mr. Scott-Paine was constantly at work playing the fast moving little ship with the sea in long and short tacks, for he and indeed all aboard were bent on putting up the best possible performance. Actually, first-class progress had been made, for the average speed was still more than 30 knots.

After passing Beachy Head at 5.50 p.m., the periodic stop was made at 6.15 p.m. to take the petrol readings. The sea was now getting calmer. Brighton was passed a few minutes after restarting. Sea conditions had further improved by 6.48 p.m., when Littlehampton was reached, and for the first time they became perfect off Selsey Bill at 7.7 p.m. Horse Sands Fort outside Portsmouth was sighted at 7.32 p.m., and Stokes Bay Pier and Calshot Light were reached 6 and 14 minutes later respectively. Another 13 minutes sufficed to see the boat at her mooring berth at the factory of the British Power Boat Co.

So regular had the running of the vessel been that she was only a minute ahead of the time set that morning by Mr. Scott-Paine for her arrival. Her average speed of more than 36.2 m.p.h. is a record that is likely to stand for a considerable time.



Imperial Airways Notes

According to the latest figures available, the eight Imperial Airways air liners of the well-known "Hannibal" and "Hercules" class have spent about 52,000 hr. in the air, and have flown a total distance of approximately 5,000,000 miles, since they were put into service in 1931. These splendid Handley-Page four-engined aircraft have been operating night and day, and in all kinds of weather and widely varying climatic conditions, with perfect reliability.

Powerful beacons are being placed at points 30 to 50 miles apart between the aerodromes on the Karachi-Rangoon section of the England-Australia air route to guide night-flying pilots traversing this section. Each beacon is 8 ft. in height and 4 ft. in diameter, and is rated at 1½ kW. The main optical system is surmounted by a red obstruction light, and as the beacon revolves, Morse light signals are flashed skyward.

Some fast timings have been accomplished on the new air mail service between Penang and Hong Kong, and on two occasions recently the full distance of 1,850 miles has been flown in a day. This service provides a connection at Penang with the England-Australia air service, and preparations are already in hand there for the introduction of the Short flying boats next year, as Penang will be one of the refuelling points on the Empire air route. The principal task being carried out is the erection of three huge petrol storage tanks, each of which weighs 11½ tons.

The work of the "finishing school" organised by Imperial Airways to train their pilots for new duties under the Empire air route expansion scheme, as described in the June *"Air News,"* has been taken over by Air Pilots Training Ltd., a new company formed specially for the purpose. The company have taken charge of the Short "Calcutta" flying boat at Hamble and the two Westland "Wessex" aeroplanes at Croydon, which are being used by the school. This step enables the school to be run separately from the ordinary commercial activities of Imperial Airways.

Air Ambulance for British Red Cross Society

The first aeroplane produced in this country solely for use as an air ambulance was christened *"Florence Nightingale"* by Mrs. Mollison at Hanworth recently. It is a Monospar S.T.25 machine, and externally is finished in white, with prominent red crosses to indicate its special purpose. The aeroplane was named in the presence of many Red Cross officials and members, and afterwards was placed at the disposal of the Society for use whenever occasion arises. There is much to be learned regarding the employment of aircraft as air ambulances, and it is expected that the experience to be gained with the *"Florence Nightingale"* will provide useful information.

The Monospar S.T.25 is a twin-engined low wing monoplane with a span of 40 ft. 2 in., reduced to 14 ft. 10 in. when the wings are folded back. The length of the aeroplane is 26 ft. 4 in. and the height is 7 ft. 10 in. It can climb at the rate of 700 ft. per min., and the greatest height it can attain is 14,000 ft. Normally the cabin is equipped to seat five passengers, but this arrangement of course is altered in the air ambulance. The large door on the starboard side of the fuselage, and the hinged portion of roof immediately above it, together provide ample room for the easy entry of either passengers or stretcher cases.

* * * *

The total weight of flying cargoes carried last year in Canada was over 27,000,000 lb., and more than 18,000 prospectors were carried during the same period.

A Junkers Ju.86 twin-engined air liner. It has a retractable undercarriage, and cruises at 193 m.p.h. Photograph by courtesy of Junkers Flugzeugwerk A.G., Dessau.

Air France Developments

Reference was made in the May *"Air News"* pages to the important additions being made to the fleet of Air France. According to the latest reports, the company have ordered a further eight Dewoitine 338 triple-engined monoplanes, carrying 25 passengers. When delivered they will be employed on the Baghdad-Saigon air route.

The two large flying boats ordered from the Loire-et-Olivier Company for the Air France air mail service between Dakar and northern Brazil have been completed. Both flying boats are of the four-engined type, and one, the Loire 102, has completed successful trial flights at St. Nazaire, where the maker's factory is situated. The other vessel is of the Loire-et-Olivier 47 type, and has been shipped to Antibes, where it will be assembled and will make its maiden flight. It can carry four passengers in addition to 10 cwt. of mail and a crew of five, and even against a 30 m.p.h. head wind it has a range of 2,000 miles. It is expected to prove capable of a top speed of 225 m.p.h.

Air France have not yet definitely decided in favour of flying boats for this South Atlantic service, and they have ordered two large four-engined landplanes for it, so that they will be able to compare the respective merits of the two types of aircraft in actual use.

Huge Sikorsky Flying-Boat Designed

The Sikorsky Aviation Corporation of America are said to have completed the designing of a huge six-engined flying boat suitable for trans-Atlantic service. It resembles the Short flying boats now being built at Rochester for Imperial Airways in having the wing mounted directly upon the hull. This wing will be of 180 ft. span. Each of the six engines will develop 1,000 h.p.

The new flying boat will be about 55 tons in weight, and it is anticipated that it will have a cruising speed of 170 m.p.h. At night the cabins in the great hull of the boat will provide sleeping accommodation for 48 passengers.

King Ghazi Buys a "Dragonfly"

King Ghazi of Iraq has bought a D.H. "Dragonfly" for his personal use. It was flown from this country to Iraq by Mr. P. de Havilland, and its arrival at the private royal landing ground, Baghdad, was witnessed by the King and other high officers. The appearance of the aeroplane is very striking, as the wings and fuselage are finished in gold, with the Iraq crown in gilt metal on each side. The King has appropriately named it *"The Golden Eagle."*

The cabin equipment is on a more luxurious scale than in the ordinary "Dragonfly," and includes a bookcase, a small cabinet to contain luncheon, and a folding table on which meals can be served or maps laid out and studied. The King makes most of his journeys about Iraq by air, and this further evidence of his appreciation of the advantages of air travel may do much to encourage civil aviation in that country.

King Ghazi of Iraq, in white suit and bareheaded, inspecting his D.H. "Dragonfly" upon its arrival at the private Royal landing ground, Baghdad. The photographs on this page are by our reader A. O. Kouyoumjian.

British Gliding Record

A new British gliding record was achieved on 5th July last by Mr. P. A. Wills, a young London shipping merchant. He took off from Dunstable at noon, and after a flight of about 110 miles he landed at Pakefield, in Suffolk, at 4.30 p.m. The highest altitude he reached was 3,600 ft. when near Whipsnade, but low clouds frequently forced him down several hundreds of feet. After each drop he regained the lost height by a wide circling movement. The glider flown by Mr. Wills was British-built and of a new high-performance type.

The previous record for a flight in a British-made glider was set up by Mr. A. L. Slater, of Matlock, who on Easter Sunday this year flew 75 miles and attained a height of 4,500 ft.

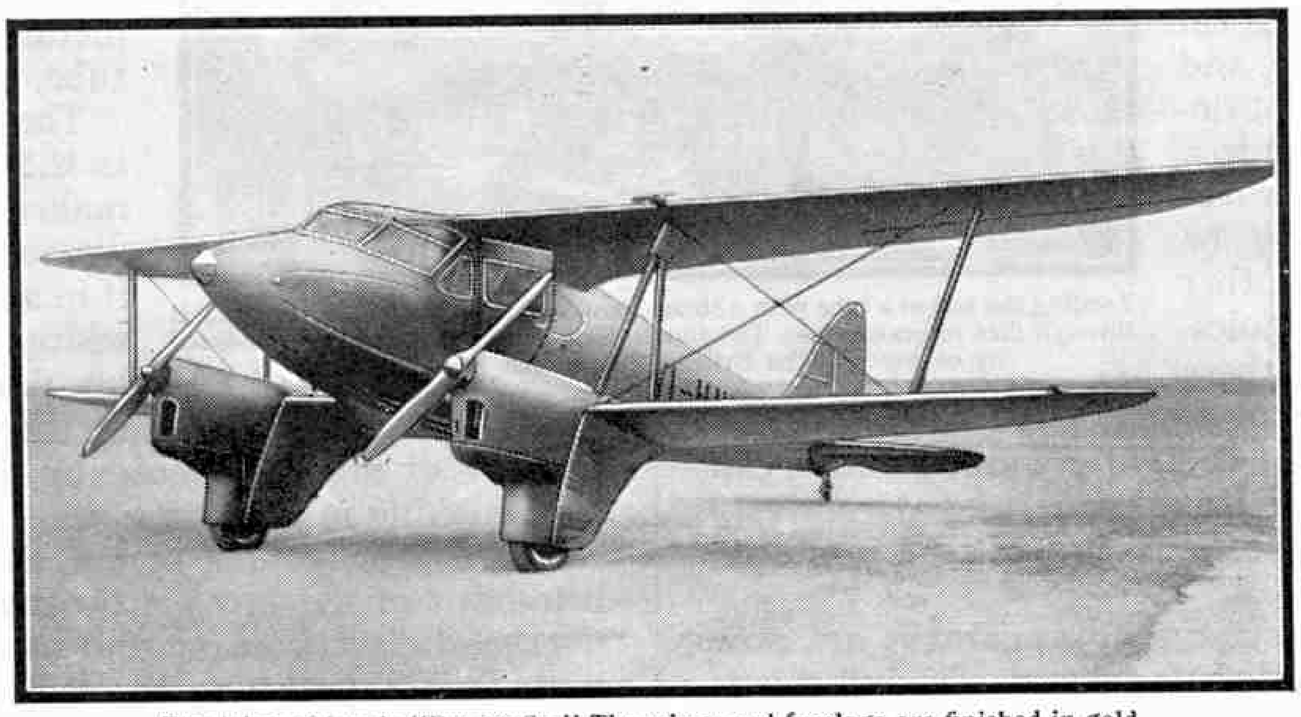
Badges for R.A.F. Machines

The aircraft of the many R.A.F. units will soon be adorned with the badge of the unit to which they belong, in addition to bearing the ordinary R.A.F. markings that have always been a familiar feature of Service aeroplanes. Under a scheme of the Air Council, a series of unit badges is being designed. Each completed design is submitted to the King, and on receiving his approval is endorsed with the words "Approved—Edward R.I." The reproduction of that design is then authorised, and after it has been registered at the College of Arms the original, bearing the King's words, is presented to the unit concerned. It is easy to understand that these original designs will be greatly treasured.

The badge of each unit will be different, of course, but a standard type of frame has been adopted. It consists of a circle coloured R.A.F. blue, bearing the name of the unit and a reproduction of the Imperial Crown, and bordered by a wreath of laurel in gold. The motto chosen for the unit appears in a scroll beneath the circle. The aircraft of operational units will be further distinguished by special backgrounds to their badges. In the case of bomber, torpedo-bomber and bomber-transport aeroplanes the background will take the shape of a bomb; for fighter squadron aeroplanes it will be in the shape of a spear-head and for army co-operation, general reconnaissance and flying boat squadron aircraft it will be a six-pointed star.

New Depot Ships for Deutsche Luft Hansa

The new depot ship *"Ostmark"* built by the Hamaldt shipyard at Kiel for the Deutsche Luft Hansa is now in service. After undergoing sea trials in the Gulf of Lubeck she sailed for Bathurst, in Gambia. The ship has been designed and built to take the place of the two regular depot ships *"Westfalen"* and *"Schwabenland,"* when either of them is withdrawn for overhaul. Her deck fittings include a catapult for sending off a loaded flying boat and a crane for hoisting it back on board when it returns. The *"Ostmark"* is of about 2,000 tons displacement, and her Diesel engines give her a speed of 15 knots. The construction of a fourth depot ship is now in hand.



The King of Iraq's "Dragonfly." The wings and fuselage are finished in gold.

The England-Johannesburg Race

The longest and most interesting air race since the MacRobertson event in October 1934 will take place next month, when an air race from London to Johannesburg, South Africa, will be flown. It is the idea of Mr. I. W. Schlesinger, a wealthy South African industrialist, and he has made it practicable by offering prizes totalling £10,000. The largest prize is £4,000, and it will go to the pilot who completes the flight in the shortest time. There will be a handicap section, and the prizes offered in this are £3,000, £1,500, £1,000 and £500 respectively.

The race is being organised by the Royal Aero Club of this country at the invitation of Mr. Schlesinger, and has the approval of the Air Ministry and of the Government of South Africa. The distance to be covered by the competitors is about 6,500 miles, and the route selected lies by way of Vienna, Cairo, Khartum and Salisbury, Rhodesia. All these places will be control points where landing will be compulsory, and it is probable that several intermediate points, where landing will be permissible but not compulsory, will also be established.

One important difference between this race and that to Australia in 1934 is that it is restricted to pilots and aircraft of the British Empire, whereas the earlier race was open to every country. Another point is that as the race is being organised at very short notice, there is not sufficient time for aircraft manufacturers to design and build aeroplanes specially for the event. The race will therefore be a thrilling test of current types of aeroplanes, and the result will be awaited with keen interest.

Long-Range Wireless on the Empire Air Routes

Remarkable examples of long-range wireless communication between air liners in flight on the Empire air routes, and between the machines and ground stations, occasionally occur under favourable conditions. Not long ago a wireless station in Cairo picked up short-wave signals sent out by an air liner flying more than 1,000 miles away, along the route to Capetown; and on another occasion two machines on the Africa route were in touch with each other by wireless when about 2,000 miles apart.

An Imperial Airways aeroplane flying across Africa has established communication with a wireless station in England, in this instance the distance being roughly 4,000 miles. Even longer range communication has taken place, as when a wireless amateur in Cape Province, South Africa, picked up short-wave messages sent out by an air liner flying 5,000 miles away.

How Seamless Steel Tubes are Made

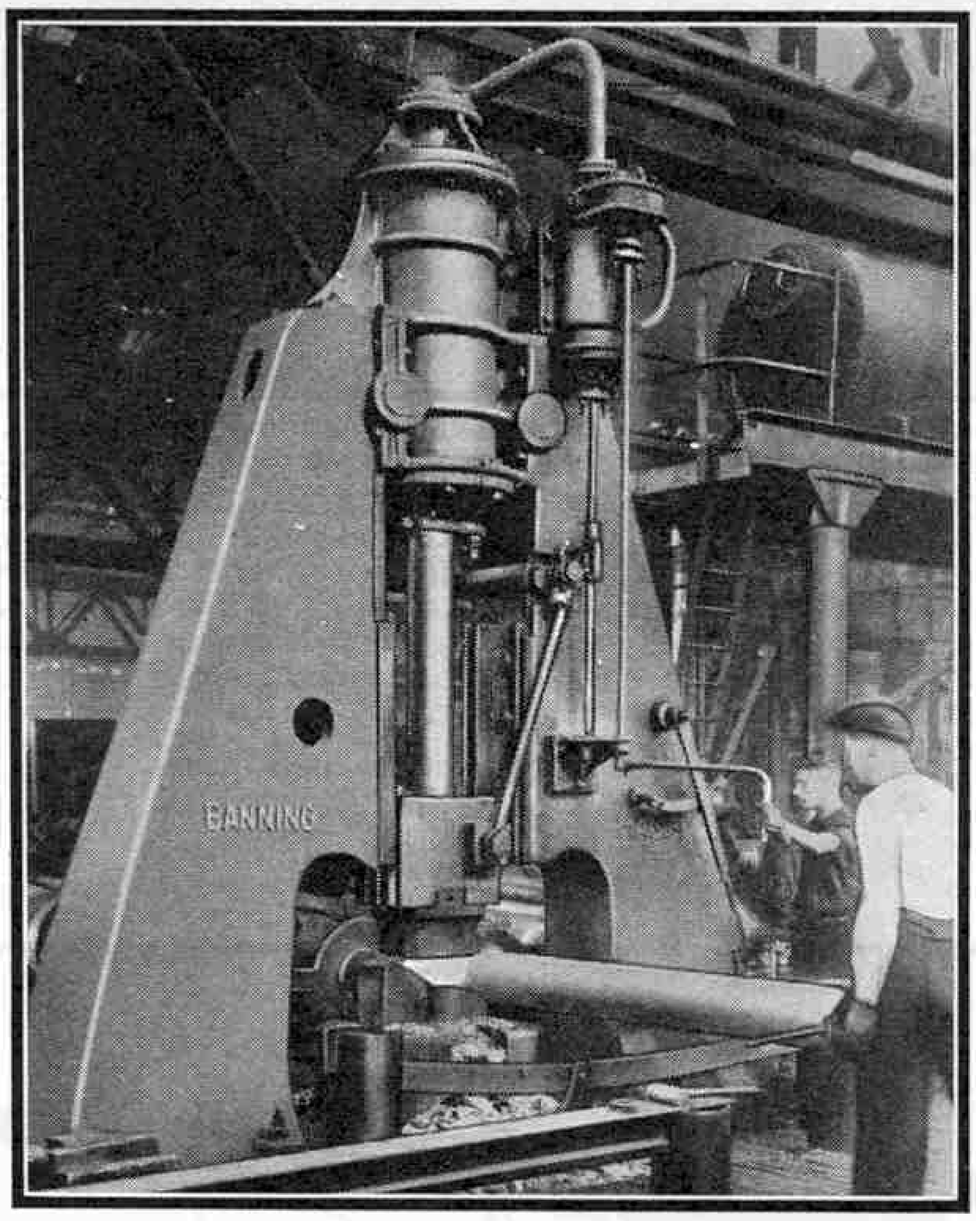
Piercing and Rolling White Hot Ingots

WE are so accustomed to the presence in our streets of steel poles supporting lamps, or the trolley wires needed by tramcars, that we are apt to pass them unnoticed unless they have been erected in inconvenient positions. Yet they are of the greatest importance, for without them it would be difficult to find suitable positions for the lamps that light our towns and cities. They also provide the best means of suspending overhead wires of all kinds, and many of them are used to carry notices guiding motorists. They are really tubes and the modern practice is to make them in one piece, without seams or any other joints that have to be welded. Such tubes can readily be produced with "steps" in them that reduce their diameter in stages. These are lighter in weight and cheaper than tubes of the same diameter throughout their length, and have no ledges, pockets or traps in which moisture can collect and set up corrosion, as the easy flow at the shoulders of the steppings gives a free run for rain water.

Another advantage of providing steps is that the tubes are given a symmetrical streamlined appearance. It is therefore unnecessary to add collars or ornamental work that might form corners harbouring moisture, and even where these are thought desirable they can be cut down to a minimum, especially when brackets or arms have to be added to carry the lamps or other fittings supported by the poles. It is not essential that these seamless tubes should be perfectly plain, however, for ornamentation in the form of straight or curved fluting can be introduced while they are being made, and attractively shaped and designed base sections also can be produced and are very largely used.

Switch gear and automatic timing apparatus are now often placed in the bases of lighting standards, and this is so complicated and delicate in action that it must be well protected. There is no difficulty in cutting an opening in the base section of a seamless pole and fitting it with a door, complete with lock and key to give ready access to mechanism of this kind, and, weather strips can be fixed above the door to prevent water from entering in wet weather and interfering with the apparatus inside. Openings also can readily be cut below ground level, in order to allow cables or gas supply pipes to be passed through.

Seamless tubes combine strength and lightness, for they are made of high tensile steel. They are easy to handle when they are being taken over rough country and during erection, and their strength makes them practically unbreakable. They even survive the impacts of heavy motor vehicles crashing into them. Many accidents of this kind have occurred, and the poles have invariably maintained their upright positions, although in some cases they have been damaged. Usually there is no interference whatever with the purposes for which the poles were designed. For instance, lamp-posts of this type have continued in service after motor coaches have collided violently with them. The mere fact that in these circumstances the poles continue to stand up is in itself a great advantage, for they probably would do much damage, and cause injury to those passing by or standing near, if they were to collapse, especially in busy thoroughfares.



Tagging the end of a tube with a steam hammer in preparation for drawing it through dies to make steps. The illustrations to this article are reproduced by courtesy of the British Mannesman Tube Co. Ltd.

The interest of these poles extends to their manufacture, for they pass through many spectacular processes. They are made in one piece from hot steel billets or ingots. These are cast at the steel works, where molten metal is tapped from a furnace and run into a huge ladle holding several tons. From this the steel is poured into seamless vertical moulds, round in cross-section, that hold the exact quantity of metal required for making the tube, and there it is left to cool.

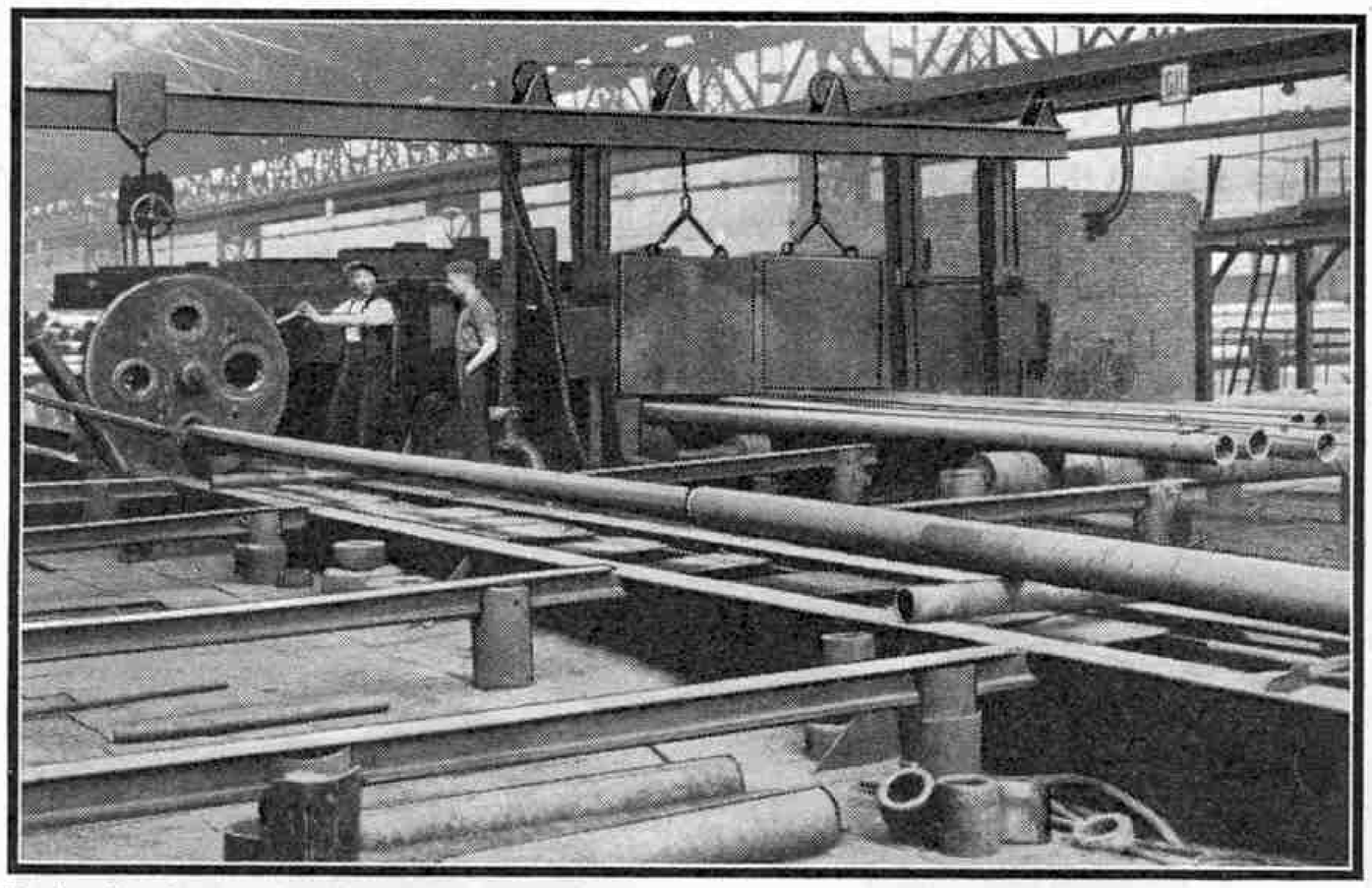
The ingot cast in this manner is the raw material of the pole maker, whose first task is to pierce a hole through it. He places it in a gas fired furnace until it is white-hot, and soft enough for his purpose. This takes several hours, but large furnaces are used and they hold a sufficient number of ingots to keep up a constant supply for the tube-making machinery.

When the ingot, or bloom, as it is called, is ready, it is lifted out of the furnace by the mechanical fingers of an overhead electric crane and carried away to the piercing mill. It is astonishing to see how easily these masses of white-hot metal are moved. There seems to be no more difficulty in placing one of them exactly where it is wanted than in lifting a lump of sugar in a pair of tongs and placing it in a teacup.

In the piercing mill the ingot, which may be about 3 ft. long and 18 in. in diameter, is firmly gripped between three rollers, set at slight angles to each other. The rollers are turned at high speed by a 2,500 h.p. steam engine acting through speed-increasing helical gearing, and they spin the white-hot ingot round. In the meantime the piercing head advances from the opposite end of the mill. This is a water-cooled steel bar, 3 in. or 4 in. in thickness, and has a sharp

point that is forced into the end of the rotating bloom. The piercer may be withdrawn once or perhaps twice to allow it to cool, but eventually it is pushed right through from end to end, and in this one operation the ingot is changed into a crude tube, from 6 ft. to 8 ft. in length, with a hole about 4 in. in diameter passing through it.

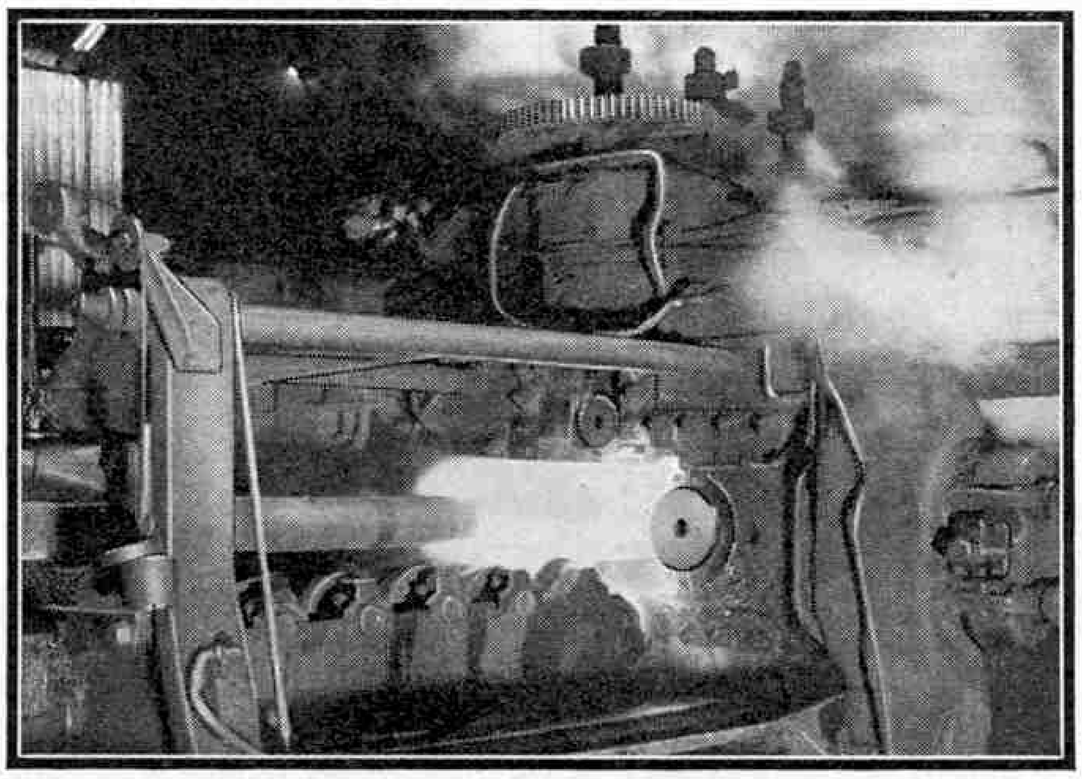
The newly-made tube is still white-hot and is immediately carried on a electrically-controlled bogey to the tube mill, which also is known as the "Pilger" mill. There a mandrel or rod with a tapering leading end is forced into the hole to open it out to the size required. Hydraulic power is used for this operation, and the bloom is pushed steadily forward against the mandrel until it has passed right over the tapering point on to the part with parallel sides that forms the inside diameter.



The drawbench, on which tubes are stepped. The dies through which they are drawn are mounted on a face plate.

The Pilger mill carries out two operations, for while the hole is being widened out the tube itself is reduced to the required outside diameter. Pressing it forward over the mandrel brings it into engagement with specially designed rolls exerting enormous pressure, which squeeze the steel and roll it out. The whole operation must be completed while the metal is almost white hot, and the steady thumps of the rollers and the hiss of steam issuing from various openings as the metal is crushed into shape combine to strengthen the impression of the exertion of tremendous power.

The mill works from one end of the pierced ingot to the other until the whole mass has been dealt with, and the effect of this spectacular process is to stretch the bloom out into a narrower tube of greater length. From a billet of the size already suggested a tube 50 ft. to 60 ft. long may be produced, but one measuring 178 ft. in length has been produced in the ordinary course of operation in the mills of The British Mannesman Tube Company Ltd., makers of these weldless steel poles. This tube is $8\frac{5}{8}$ in. in outside diameter, and is the longest ever produced without seam or join of any kind.



The piercing head penetrating a white hot ingot in the piercing mill, and forming it into a crude tube.

The mandrel is then extracted from the tube, and this is carried forward to the cutting bench, where its ends are squared and it is weighed and allowed to cool down. Careful examination follows. The tube is supported at its ends on pairs of rollers that rotate and so turn it round, and it is then easy to see if it is straight. If necessary, irregularities of this kind are corrected in a press. At this stage the tubes are cut to the length required. It is more economical to produce them in great lengths and then to cut them than it is to make them in short pieces separately.

The steps that reduce the width of a finished steel pole in stages towards the top have now to be made. The sizes of the steps vary, but a pole with a width at its base of 8 in. may have upper sections 7 in. and 6 in. in diameter. The reductions are made by drawing the red-hot tube through a die. For this purpose one end of it is "tagged." This means that after heating the end is beaten down by a steam hammer to form a surface that can be gripped by toothed jaws. The end is threaded through the die on the drawbench, where this operation is carried out. It is then seized by jaws attached to a sliding carriage that is clipped to a continuous chain hauled by an electric motor, and these pull it through the die, which narrows it down, and produces the smooth symetrical step.

The size of the die used in this process of course is that required for the step being made, and the operation is repeated for the other steps to be given to the pole. All the dies required for any size of tube are set up in suitable positions around a face plate on the drawbench, so that the whole of the drawing operation can be finished quickly while the metal is hot enough. It may then be necessary to straighten the tube again, and in that case it is reheated and passed through a press.

The many types and varied designs of poles that can be seen in our streets are produced in this manner and their special features are introduced during the drawing operation or by other manipulation. For instance, lamp posts vary considerably in size and form according to the system of lighting in which they are to be used. Some carry the lamps on top and others have arms from 3 ft. to 10 ft. in length. In many cases the poles are fixed at the sides of the road, and wires are stretched between them so that the lamps can be suspended in the middle. The poles for these conditions require special designing and the loads they have to support must be taken into account in order that they are not deflected or bent to a noticeable extent when in service. Allowance also must be made for the effect of wind pressure both on the poles and on the lamps they carry. The bases of the poles rest upon horizontal steel plates placed deep in hard ground or set in concrete.

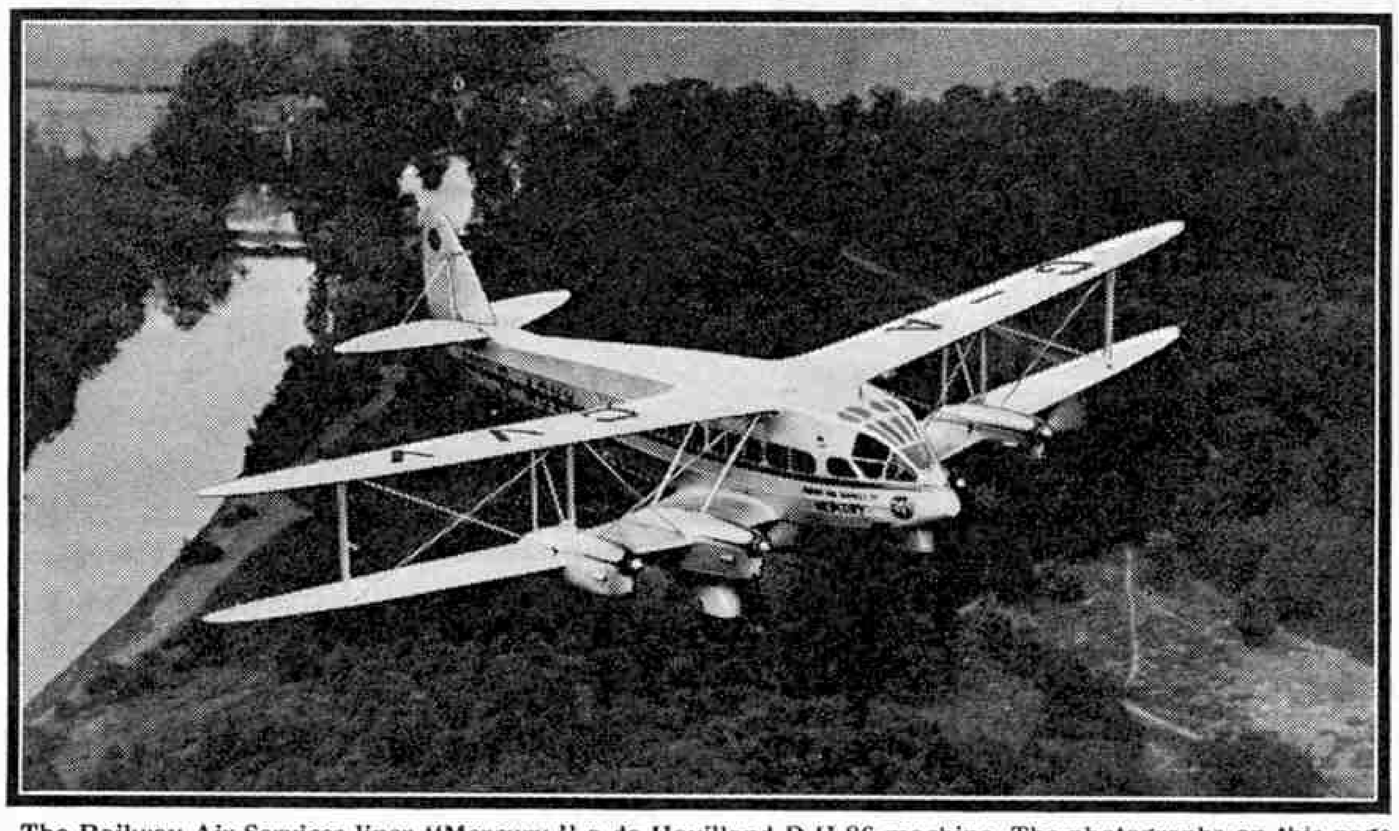
For the information contained in this article we are indebted to the courtesy of The British Mannesman Tube Co. Ltd., Newport, Mon.

Belfast to Liverpool by Air Liner

Impressions of a Cross-Channel Flight

By O. S. Nock, B.Sc., D.I.C.

IT is one of the marvels of this age of speed that the fastest means of travel are incomparably the most soothing and restful. The smooth even pace of a really fast train like "*The Silver Jubilee*" dulls one's sense of speed completely, unless of course you are clocking the quarter-mile posts (!), but the progress of a modern air liner at 200 m.p.h. is so sedate that anyone seeking the thrill of sheer speed would be sadly disappointed. On a recent air journey from Belfast to Liverpool by Railway Air Services there was an entire absence of bustle, formalities were conducted in a quiet leisurely way, and the watchword as far as the passengers were concerned might well have been, "There's no hurry!" Yet from port to port we averaged 130 m.p.h.



The Railway Air Services liner "Mercury," a de Havilland D.H.86 machine. The photographs on this page are reproduced by courtesy of Railway Air Services.

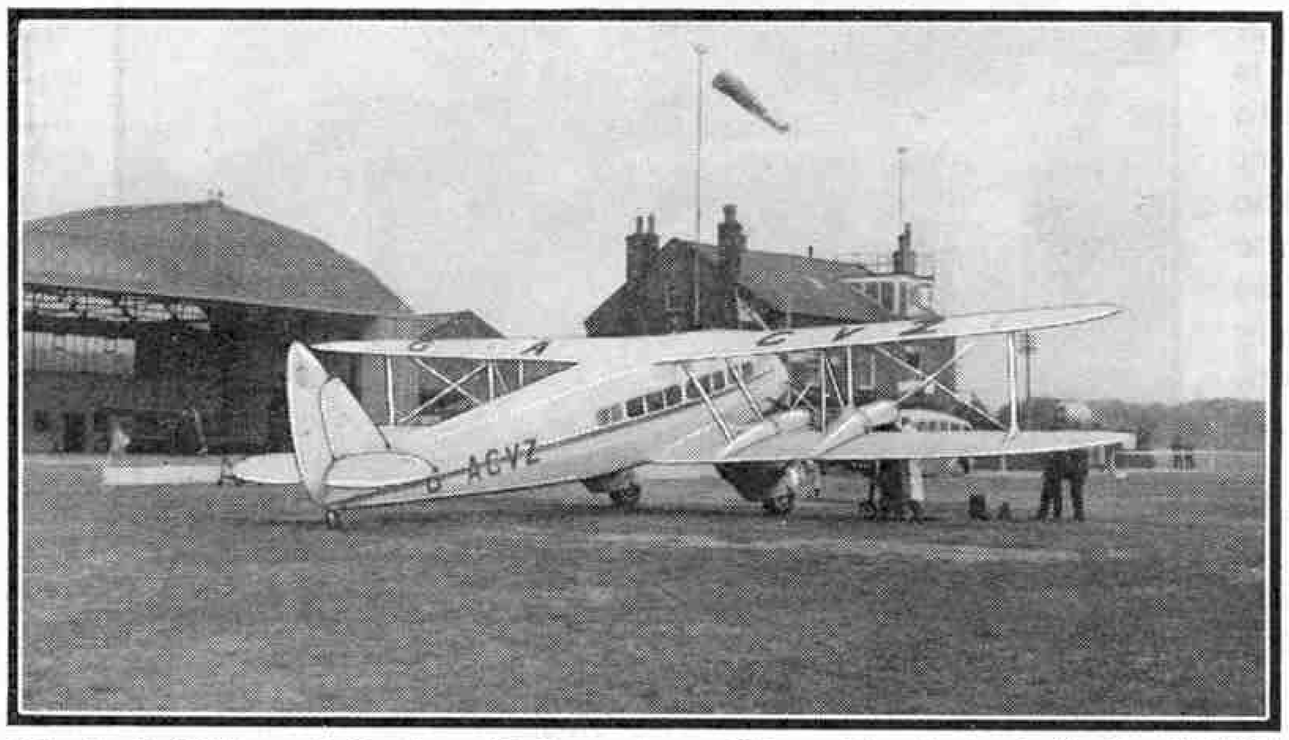
One of the few disadvantages of air travel is that the ports are necessarily situated some miles from the centre of big cities. In his speech at the opening of Gatwick airport, in June last, the Secretary of State for Air said that there would never be an airport in Central London unless the population grew so air minded and so unæsthetic as to pull down every tree in Hyde Park. So it is with other cities. In this country, although the speed while in the air is infinitely faster than anything that has yet been regularly scheduled on land, unless you happen to live close to the aerodromes at each end the fastest means of travel between cities up to about 100 miles apart is still by train. It is when the distance exceeds 200 miles, or the sea has to be crossed, that air transport has such a tremendous advantage. The R.A.S. time of 5½ hours from Glasgow Central Station to Victoria Station, London, including the road journeys at each end, is a big improvement on the 7½-hour run of "*The Royal Scot*," while 4½ hours from Belfast to London puts the 12 hours 20 minutes of the "*Ulster Express*" completely in the shade.

The Belfast airport was, until recently, at Aldergrove, on the shores of Lough Neagh near Antrim, but a short time ago it was transferred to Newtownards in County Down, much nearer the city, but still 10 miles out. A comfortable car picked up passengers in Belfast at about 8.15 a.m. and a pleasant run of about 25 minutes brought us to the airport. It was a very still morning; a hot sun was breaking through and slowly dispersing a mist that hung over the land after a night of rain. Scrabo Hill to the north of the aerodrome, crowned by a monument to a former Marquess of Londonderry, looked very lovely through a thin veil of cloud. Just as we arrived, the air liner "*Mercury*" was approaching, having left Renfrew, the Glasgow airport, at 7.50 a.m. She flew right across, circled round and made a beautiful landing facing what wind there was. "*Mercury*" is one of the well-known de Havilland D.H.86 machines, having four engines each of 200 h.p. and accommodation for eight passengers.

At the time of my trip the German Ambassador-at-large, Herr von Ribbentrop, was in Ulster; his aeroplane was at Newtownards, and was in striking contrast to the R.A.S. air liner. The German machine was a very powerful Junkers monoplane bearing the name "*Wilhelm Siegert*"; it was painted black and carried the familiar Nazi swastika on the tail. "*Mercury*," on the other hand, is finished aluminium colour picked out with red and green linings, and flew the pale blue ensign while on the ground.

There were four other passengers besides myself, and while our luggage was being weighed and other formalities gone through the machine was being refuelled. The passenger compartment of these liners is most comfortable. It is just wide enough to accommodate two passengers abreast in cosy armchair seats, one on each side of the central gangway. Windows extend almost the whole length of the compartment and give a splendid look-out. Luggage and mails are carried in the tail end of the fuselage.

On the stroke of time, 9 a.m., we were off. First of all we ran across the grass to the extreme south end of the landing space. The machine floated smoothly over the uneven patches on the ground, and then it was neatly pivoted round in readiness to take off up wind. Then, full throttle; the engines roared, and after a very gentle start "*Mercury*" developed a truly lightning acceleration. In less than a quarter of a mile we were travelling at 90 m.p.h. and at this speed we took-off, though the exact moment was very difficult to judge.



"Jupiter," of Railway Air Services, at Speke aerodrome. This machine also is a de Havilland D.H.86.

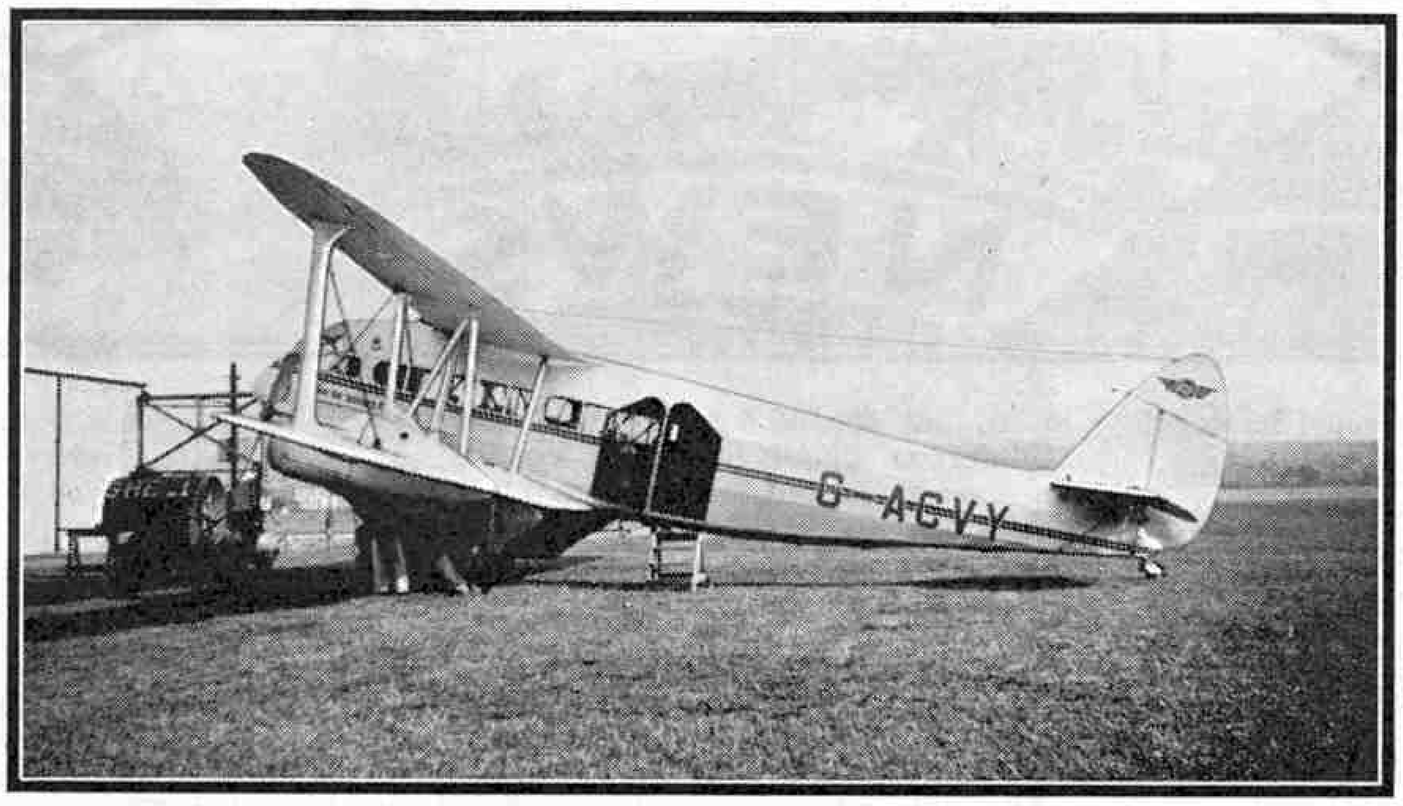
We soared over the town of Newtownards, all the time swinging round on to our true course, which was approximately south-east; while the machine is banking you get the rather curious impression that the earth below is tilting up towards you—the machine seems perfectly horizontal. We were soon flying over Strangford Lough. Newtownards lies at the head of this long inlet of the sea and the country on both sides of the water is very flat. Fields showed as a chequered pattern; I could just pick out the ruins of Grey Abbey on the eastern shore, and westward a long line of white cumulus clouds sailed level with us where earth and sky blended in the haze.

The tide was out, and from the eastern shore curiously shaped spits of sand trailed out into the water; from above they looked like so many fantastic worms. The long peninsula that separates Strangford Lough from the sea is never more than five miles wide, and at about 9.6 a.m. we passed over the coast near Cloghy Bay. The whole Ards peninsula is very flat and it could be seen stretching

away to the south in a long succession of capes and bays, without a sign of hill or cliff, until it faded into the distance.

And now sky and sea merged together in a soft blue haze; far below, the water was an intense ultramarine; a few detached little clouds sailed high overhead, and the sense of motion became almost imperceptible. With a complete absence of vibration, the cosy well-ventilated cabin and ever-present drone of the engines induced a strong desire for sleep, and several of the other passengers were nodding over their newspapers before long. Outside, the sun flashed on the silvery aluminium paint of the wings and spars, there was only the slightest motion on the sea below, and it seemed incredible that we were travelling at a land speed of 210 m.p.h.

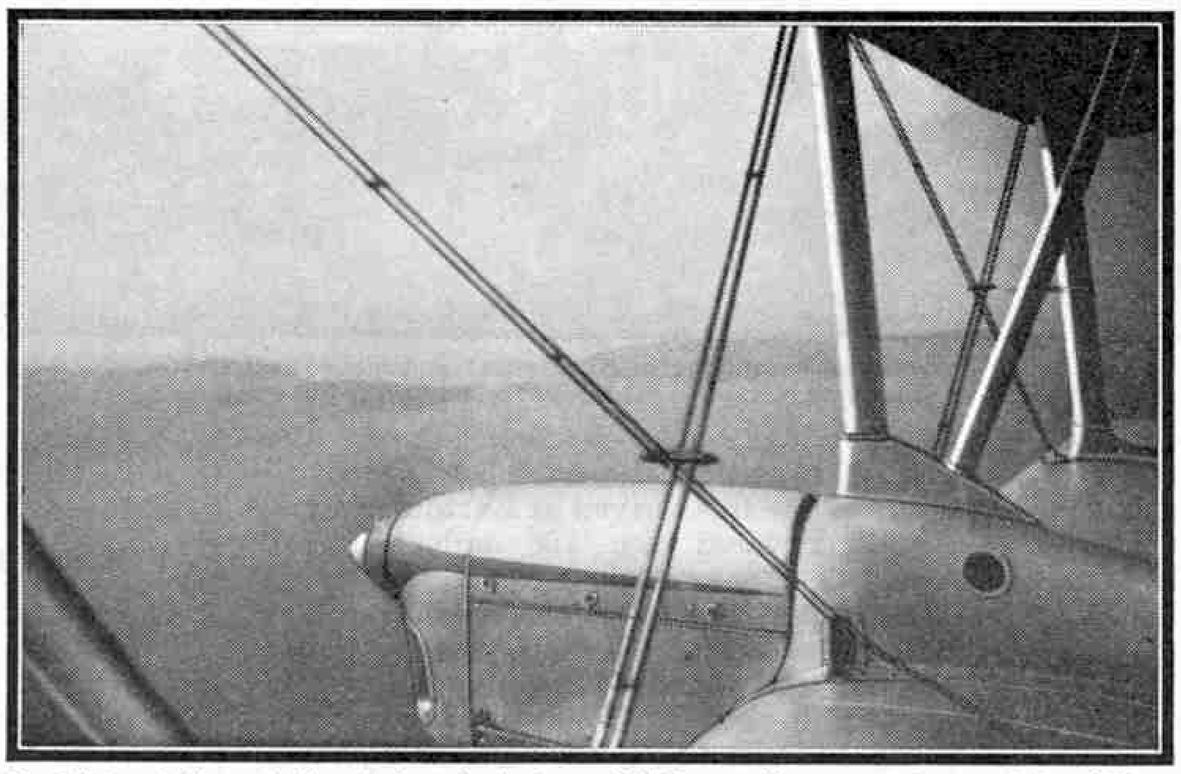
The air speed of this machine is 143 m.p.h.; this is the actual speed at which we should travel in perfectly still air, but the land speed naturally varies according to the direction and strength of the wind. In the early stages of this flight conditions were most favourable and the Captain expected to reach Liverpool at 9.59 a.m. The motion was generally very smooth and this is usually the case over the sea in fine weather; occasionally the machine dipped slightly, giving a momentary sensation like that of a lift beginning to descend, but each time this motion was instantly checked.



Refuelling the air liner "Mercury" at Newtownards immediately before the flight described in this article.

In less than 10 minutes after our last sight of the Irish coast we were nearing the Isle of Man. Although we were flying at about 2,000 ft. the haze restricted visibility to about six or seven miles; this in a way was most fortunate, for we came upon the island quite suddenly, and a fascinating sight it was! Seen against the strong sunlight, coast and mountain appeared alike as one bluish-grey shadow; queer, devoid of all detail, it looked a veritable phantom isle riding out at sea. But we were approaching at nearly 200 m.p.h.; detail was quickly revealed. To the north was Niarbyl Bay, where the oddly named peak Cronk-ny-Irey-Lhaa sweeps down to the sea; we were heading straight for Port Erin, and at the southern end of the island lay the Calf of Man, a small rocky islet.

In less time than it takes to describe we had reached the coast and Ronaldsway aerodrome lay far below on our left. Port Erin lies on the western shore of a narrow isthmus only two miles wide, and as we crossed to the opposite coast the aspect of the land changed entirely. Looking backward now the sun was behind, and the whole countryside was picked out in a wealth of exquisite detail. Right below was the picturesque haven of Port St. Mary, its little stone jetty and lighthouse standing out vividly against the blue of the sea; southward to the Calf stretched a rock-wall of magnificent cliffs, while to the north behind Castletown rose the big hills that run northward like a backbone. A red-funnelled paddle steamer was making its way up the coast, leaving a foaming wake that from above looked dazzling white against the deep blue of the sea. It was just as though we had been taken for a novel and lightning tour of the southern end of the island, but although its geography had been so quickly unfolded and almost as soon lost again in the haze, there was none of the breathless haste in seeing beautiful country from a fast train, and the illusion that we were travelling quite slowly remained perfect.



Looking out through the starboard windows of "Mercury" approaching the Isle of Man. In the distance on the right is the Calf of Man.

Up to now the wind had been northerly and had helped us not a little in attaining our high land speed, but after we had passed over the Isle of Man it veered round eastward and became quite strong; our air speed of course remained constant at 143 m.p.h. but our land speed was reduced considerably and it was soon evident that we should not reach Liverpool airport until some minutes after what had been anticipated earlier. We came down to about 1,500 ft. and the Captain told me afterwards that the side wind became so strong that he had no less than eleven degrees of drift on. The angle of drift is the angle between the course and the direction the machine would be flying if there were no wind, and from this the navigating officer can calculate the strength and direction of the wind. Just as in the case of a ship, the Captain of an air liner has to make a log of the journey that includes all such particulars; the reports are handed in at each aerodrome where the machine calls, and from these notes weather conditions are wirelessed to all flying stations in the British Isles. The actual steering of these machines is done almost entirely by compass.

As we approached the English coast the haze, which had shown signs of clearing as we came eastward, slowly changed into a grey mist that foretold rain; the air was still too thick to see any great distance but the sea became covered in white breakers. The change in the weather was as surprising as it was complete. Over the Isle of Man it had every appearance of a sultry summer day, calm and quite settled; now the grey clouds were racing across the sky and the machine was bumping a little more frequently.

We were now flying over the steamer track leading to the Mersey; a big merchantman homeward bound was quickly overtaken, and just beyond, a graceful schooner was similarly overhauled. Then at 9.55 a.m. we passed over the Bar lightship. Here is the beginning of the narrow channel that leads through the shallows of the Mersey estuary into the port of Liverpool; it is fascinating enough when seen from the water, especially at night when the gas buoys are flashing red and white, but from the air the winding zig-zag course can be seen in its entirety. The worst bends are marked by the Crosby and Formby lightships, and the long double chain of buoys looks rather like the cork floats of a drift net when seen from an aeroplane. Between this chain of dots steamers were coming and going, and dredgers were at work in several places.

By now the Lancashire coast showed up as a long grey line, the clouds were quite low, there was a hint of rain, and then quite suddenly out of the mist we came upon the mouth of the Mersey, and New Brighton lay below on the right. We flew right up the course of the river, over miles of docks and the shipyards of the Wirral side. Smoke and the mist combined to give the impression that there was fog below though actually we were travelling through the fringe of a cloud. The speed seemed much higher now and familiar landmarks followed each other so quickly that many others went unrecognised.

After crossing the city the air cleared again, though it was now raining hard; we came out over the wide inner basin of the Mersey, past Garston docks, and then the engines went suddenly quiet and we began to turn and descend. Banking moderately we traced out a perfect circle, over the vast railway yard at Speke Junction where every wagon and siding stood out clear to the smallest detail, right out over the river again, and so down to make a beautifully smooth landing at Speke airport. It was 10.8 a.m. and we had covered the 147 odd miles from Newtownards in 68 minutes, an average speed of 130 m.p.h.

So ended a fascinating and most enjoyable trip. To the very end the impression that we had not travelled really fast persisted, though the striking weather changes alone were ample evidence to the contrary, quite apart from the brief time we were in flight.

Fine Performances on the Liverpool Services

A good example of the consistently fine running put up on the *"Liverpool Flyer"* occurred recently, when the train was divided. The first portion left Lime Street at 5.20 p.m. and was booked to run the 188.2 miles to Willesden Junction non-stop in 191 minutes. No. 6209, *"Princess Beatrice,"* a 4–6–2, was the engine, with that prince of drivers L. A. Earl of Camden at the regulator. The load was 390 tons behind the tender.

Speed was 71 m.p.h. as early as Allerton, 5.7 miles out of Liverpool, but a very severe check at Runcorn caused Weaver Junction to be passed nearly 3 minutes late. Wonderful running followed with speeds of 71 to 75 m.p.h. all the way up the gentle rise to Crewe, and despite a signal check approaching the station that important centre was passed on time, 35½ miles from Liverpool in 43 minutes.

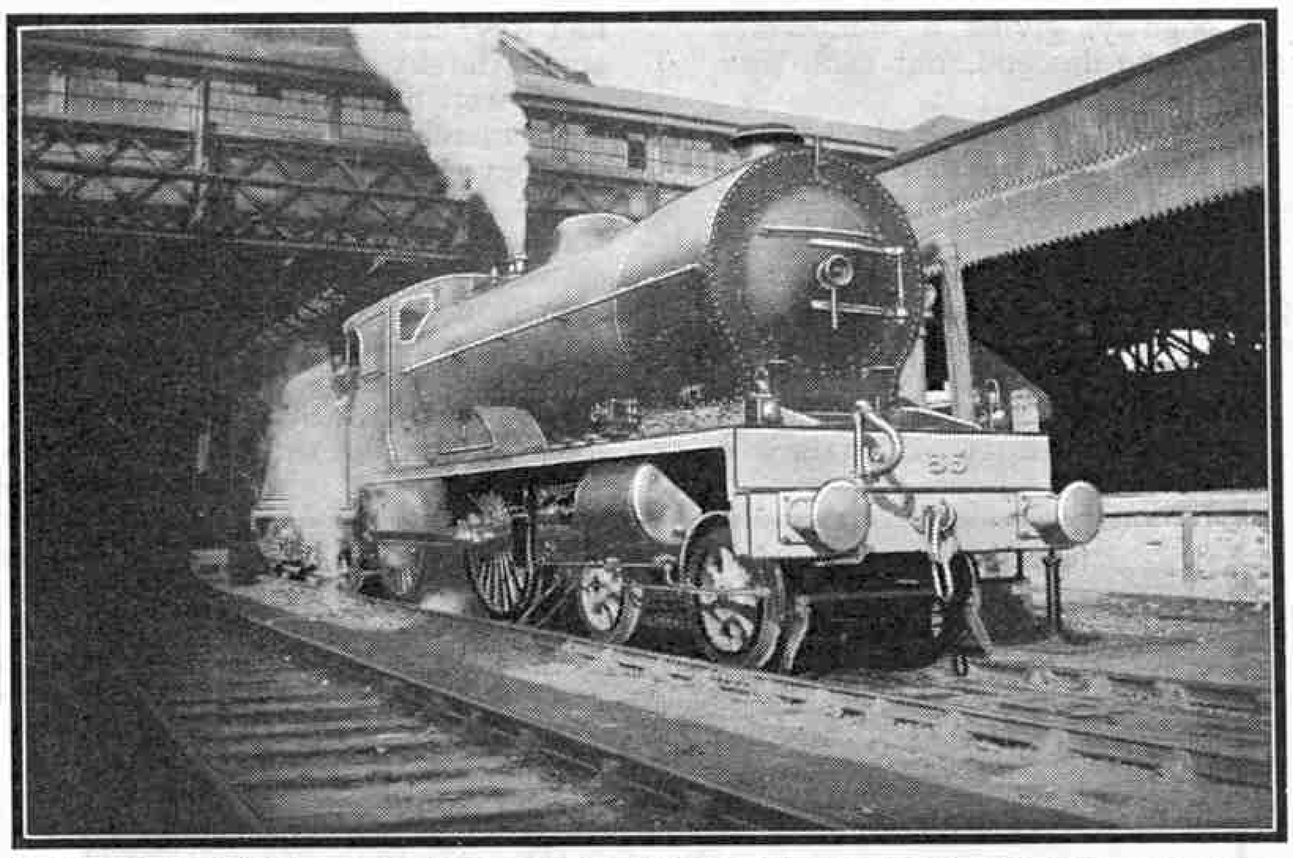
With the most scrupulous observance of the slacks at Norton Bridge, Stafford and Polesworth colliery the 75½ miles on to Rugby took 73 minutes, the highest speed being 83½ m.p.h. near Tamworth; but after a brilliant recovery from the usual slowing through Rugby the train was brought practically to a dead stand by adverse signals at Weedon. In consequence Earl ran more moderately for some distance, but beyond Wolverton he opened out to some purpose and ran the 15 uphill miles from Bletchley to Tring at an average speed of 74 m.p.h.! The train passed Tring summit 161.9 miles in 165½ minutes, 2½ minutes early in spite of all delays.

Descending towards London speed was up to 83½ at King's Langley. Another severe delay was experienced at Watford, but a glorious finish with yet another maximum of 80 m.p.h. brought the train into Willesden on time. The net time for the 188.2 miles was only 177 minutes, the run having been made in 14 minutes under schedule at an average speed of 63.8 m.p.h.

The Liverpool expresses altogether have been distinguishing themselves recently and on one occasion the first part of the down *"Merseyside Express,"* loaded to 510 tons gross behind the tender, made one of the fastest runs ever recorded with so heavy a train. Signal checks made the time out to Tring 41¾ minutes for the 31.7 miles, but the 48.6 miles from there to Hillmorton signal box were covered at an average speed of 69.3 m.p.h.! This performance was all the more meritorious in that the engine was not a "Princess" 4–6–2, but a "Royal Scot," No. 6111, *"Royal Fusilier,"* ably handled by Driver Bishop of Camden. The lost time was more than regained by the time Rugby was passed, after which the express ran punctually all the way to Liverpool.

We are indebted to Mr. O. S. Nock for these timings.

"The Ulster Express" made a good run with a heavy load between Crewe and Euston recently. The train left Crewe 17 minutes late but arrived at Euston on time, having covered the 158 miles in 148 minutes, at an average start-to-stop speed of 64 m.p.h. The train was made up of 14 vehicles weighing 421 tons tare, or about 445 tons fully loaded, and the engine was 4–6–2 No. 6204, *"Princess Louise,"* in charge of Driver F. C. Brooker and Fireman R. Speed, of Camden. Between Rugby and Willesden the average speed was 70 m.p.h. for 77 miles.



G.N.R. of Ireland 4-4-0 compound locomotive No. 85 "Merlin" at Amiens Street, Dublin. The engine is painted in the striking blue livery referred to in these pages last April. Photograph by Mr. O. S. Nock.

Southern Summer Services

The provision of more and faster trains is the keynote of the S.R. Summer services that have been in operation since Sunday, 5th July. In addition improvements have been made in various through and cross-country services. The growth of traffic in recent years has been such that many of the trains previously introduced as reliefs are now included in the timetable as regular services.

Various West of England trains have been speeded up; 17 minutes have been deducted from the timing of the 10.35 a.m. from Waterloo to Ilfracombe on weekdays, and Weymouth is now reached in the fastest time yet achieved, 2 hrs. 54 min. The journey time of the up *"Bournemouth Belle"* Pullman express has been reduced by 8 minutes. An interesting feature of the new services is the standardisation of the departure times from Southampton Central of the up Bournemouth and Weymouth trains. These now depart at 20 minutes past each hour from 11.20 a.m. to 7.20 p.m. inclusive, each weekday.

The new signalling and track improvements between Waterloo and Surbiton, that were described in last month's issue, are proving their worth during the conduct of the heavy Summer traffic.

Additional electric trains are being provided as necessary at week-ends between London and various South Coast resorts. On Saturdays throughout the season intensive services to the Kent Coast are being maintained, and there is also a heavy list of extra trains on the Portsmouth route.

Cross-country and coastal services between Sussex and the West of England show a total saving of 210 minutes as compared with previous years. The through service between Margate and Ramsgate and Birmingham and Wolverhampton in conjunction with the G.W.R. is being duplicated on Saturdays.

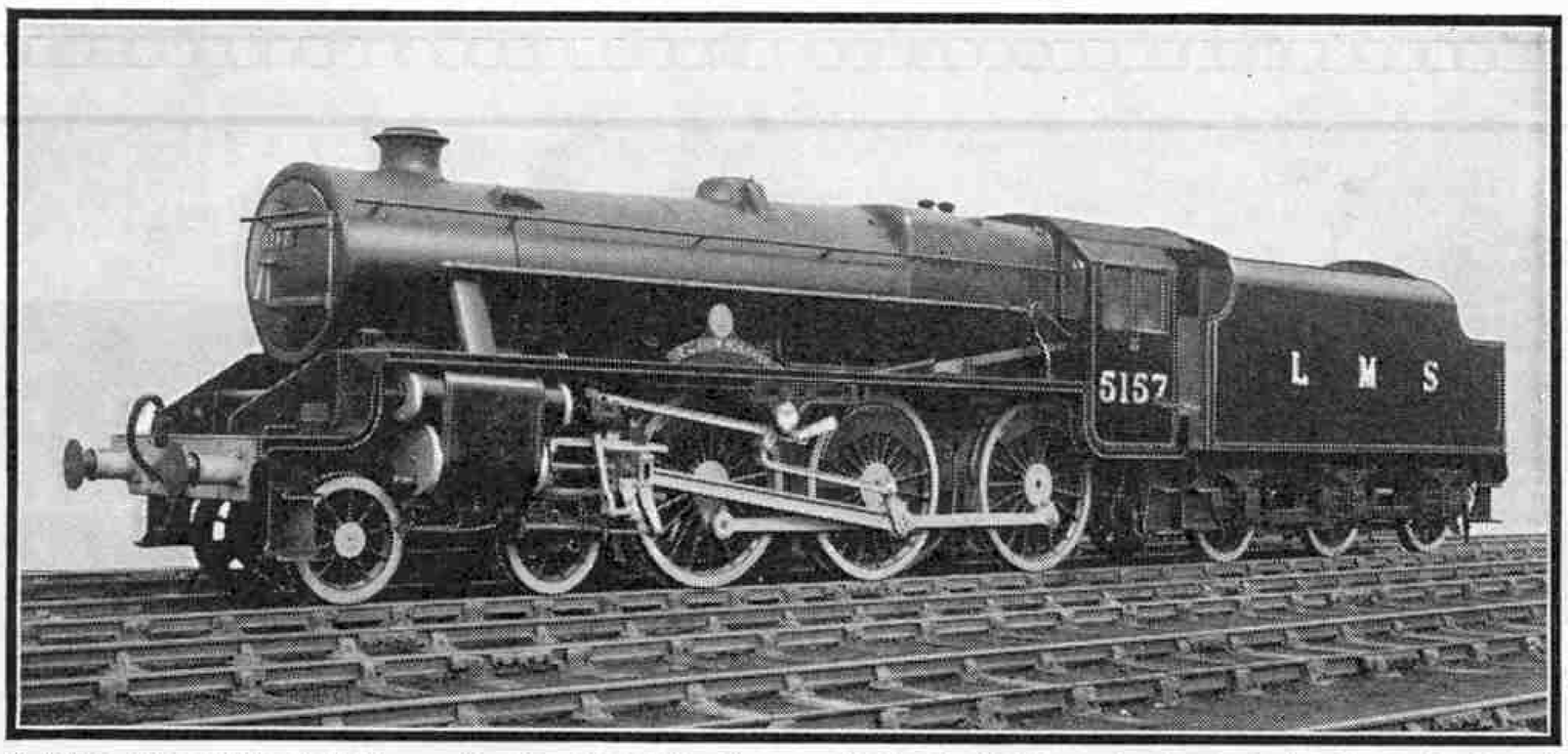
Names for New G.W.R. Locomotives

After the "Castles" and the "Halls," "Granges" and "Manors" are to be added to the series of class names of G.W.R. locomotives, and 10 of each of the new classes are being constructed this year. Their numbers and names are as follows: No. 6800, *"Arlington Grange"*; No. 6801, *"Aylburton Grange"*; No. 6802, *"Bampton Grange"*; No. 6803, *"Bucklebury Grange"*; No. 6804, *"Brockington Grange"*; No. 6805, *"Broughton Grange"*; No. 6806, *"Blackwell Grange"*; No. 6807, *"Birchwood Grange"*; No. 6808, *"Beenham Grange"*; No. 6809, *"Burghclere Grange"*; No. 7800, *"Anthony Manor"*; No. 7801, *"Ashley Manor"*; No. 7802, *"Bradley Manor"*; No. 7803, *"Boston Manor"*; No. 7804, *"Baydon Manor"*; No. 7805, *"Broome Manor"*; No. 7806, *"Cockington Manor"*; No. 7807, *"Compton Manor"*; No. 7808, *"Cookham Manor"*; No. 7809, *"Childrey Manor."*

L.M.S.R. Locomotive News

In addition to the naming of class "5P5F" locomotives Nos. 5157 and 5158 *"The Glasgow Highlander"* and *"Glasgow Yeomanry"* respectively, No. 5156 of the same class has been named *"The Ayrshire Yeoman."* The "Royal Scot" class locomotive No. 6127 formerly *"Novelty"* is now *"The Old Contemptible."*

Recent withdrawals include three further rebuilt "Claughtons," No. 5957 and No. 6013, both fitted with Caprotti valve gear, and No. 5993 with Walschaerts valve gear. The ranks of the Horwich type four-cylinder 4–6–0s also are being depleted, and further 4–6–0 locomotives of the L.N.W.R. "Prince of Wales" and mixed traffic classes have been scrapped. The scrapping of the former L.N.W.R. "George The Fifth" and the similar superheated "Precursor" classes is proceeding with great rapidity. Engines recently withdrawn include No. 5270, *"Marmion,"* the last of the few "Precursors" that were superheated without being rebuilt. These engines retained their original slide-valve cylinders and their short smoke-boxes. *"Engineer Watford,"* the last of the former L.N.W.R. engineer's service locomotives, has been scrapped. It was the last of the 2–4–0 "Jumbos" with 6 ft. driving wheels and straight-link motion.



L.M.S.R. two-cylinder 4-6-0 locomotive No. 5157 "The Glasgow Highlander." This engine is attached to St. Rollox Depot, Glasgow, and is fitted with tablet exchange gear for use on the Highland Section. Photograph by courtesy of the L.M.S.R.

L.M.S.R. Rolling Stock Programme

In addition to the building of 687 passenger vehicles that are to be completed this year, the L.M.S.R. are carrying out an extensive modernisation programme of the existing coaching stock. The low waistline, giving deeper windows and better observation facilities, that has characterised more recent vehicles, is being standardised as a permanent feature for main line stock.

Under a plan inaugurated in 1933 for the replacement of 70 of the older dining cars, 42 new cars have been put into service, and the remaining 28 will be built either this year or next. To replace the cars in Scotland formerly operated by the Pullman Car Company Ltd., but since taken over by the L.M.S.R., seven composite first-third dining cars are to be built during 1936-7. In addition 20 new kitchen cars for use in excursion trains are to be introduced.

A plan that was begun in 1934 for the replacement or renovation of the whole L.M.S.R. stock of sleeping cars will be completed this month. This has involved the building of 13 new first-class sleepers and of 13 composite cars; also the renovation of 64 first-class vehicles and of 12 composites. In a stock of nearly 17,000 passenger vehicles the L.M.S.R. have 200 dining cars and 232 sleeping cars.

The Fastest Train in the World

The record for the fastest start-to-stop run in the world, which has been held since May 1933 by Diesel articulated trains of the German State Railway, has passed to the United States. The *"Super-Chief"* of the Atchison, Topeka and Santa Fé system on its run from Chicago to Los Angeles is scheduled to cover the 202.4 miles from La Junta to Dodge City in 145 minutes, at an average start-to-stop speed of 83.7 m.p.h. A twin-unit Diesel-engined locomotive of 3,600 b.h.p. hauls the train of seven to nine cars weighing 500 to 650 tons.

Acceleration of *"The Granite City"*

With the acceleration from Monday, 6th July, of *"The Granite City"* express from Glasgow to Aberdeen by 33 minutes, a timing of 3 hrs. 12 min., the fastest on record, has been instituted between these cities. Stops are made at Perth and Stonehaven only. The 1.40 p.m. from Glasgow now makes the journey in 3 hrs. 18 min., an acceleration of 37 min., and stops only at Gleneagles, Perth and Stonehaven.

Other important L.M.S.R. improvements in Scotland include accelerations between Glasgow and Inverness, together with the running of a new express at 4.30 p.m. from Glasgow to Inverness. By connection at Perth, this train affords a one-day service from the Midlands and North of England to the Highland capital.

The giant name of 58 letters that distinguishes the North Wales station shown in the timetables as "Llanfair." The special canvas streamer seen in this photograph is in use during the Summer season only. (H.R.C. prize-winning photograph.)

Streamlined "Mikados" for the L.N.E.R.

The new series of four 2–8–2 passenger locomotives, the names of which were given in last month's *"M.M.,"* are generally similar in design to the existing No. 2002, *"Earl Marischal,"* in having piston valves instead of the poppet valves of No. 2001, *"Cock o' the North."* They are however streamlined in a similar manner to the A4 class "Pacifics" of the *"Silver Link"* series. This streamlining has been carried out in order to render the engines more suitable for service on the exposed parts of the line between Edinburgh and Aberdeen, where strong north-east winds are frequently encountered.

The first of the new 2–6–2 or "Prairie" type tender engines are now in service. An illustration and description of the first engine built, No. 4771 *"Green Arrow,"* appears on page 452 of this issue.

Brisk Work by a "Schools" Class Engine

Mr. O. S. Nock sends us the following notes:—

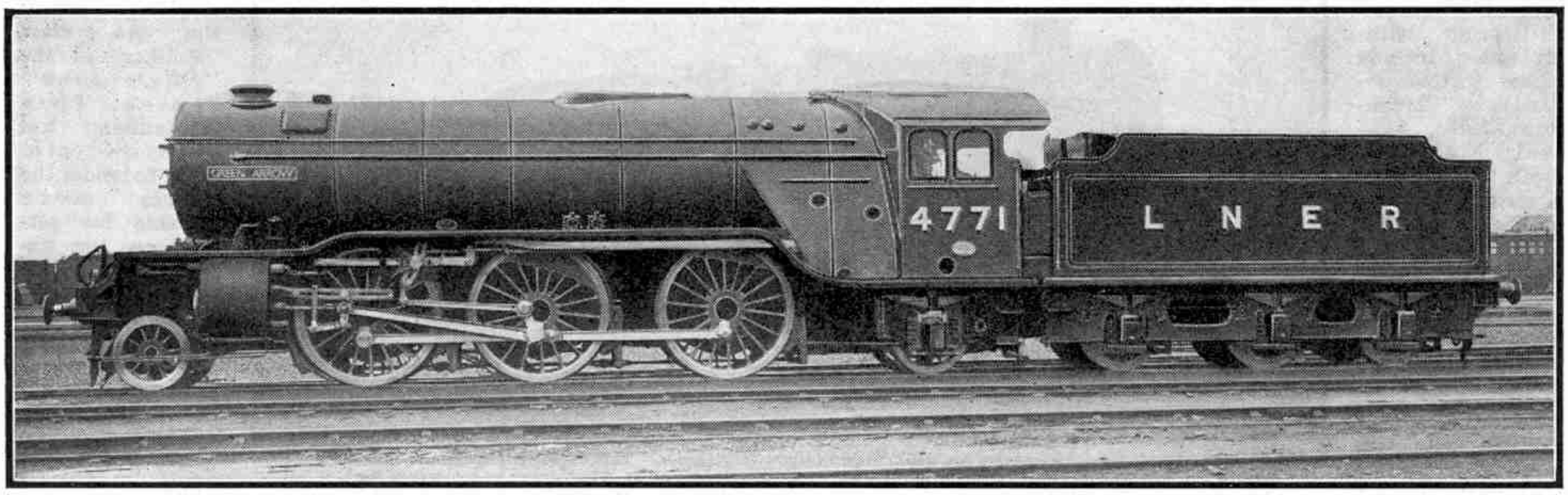
With the 80-minutes London-Folkestone expresses, the "Schools" class 4–4–0s of the Southern Railway continue to give striking evidence of their ability. On a recent run No. 917, *"Ardingly,"* had a load of eleven cars, 390 tons behind the tender, and yet ran the 25.6 miles from Smeeth to Paddock Wood at an average speed of 73.2 m.p.h. The maximum was a sustained 79 m.p.h. at Headcorn and the train passed Tonbridge, 40.4 miles from Folkestone, in half a minute under the very fast schedule of 39½ minutes; speed fell to 34½ in the 1 in 122 ascent to Sevenoaks tunnel, but a splendid finish with a sustained maximum of 75 m.p.h. near Chislehurst took the train through Hither Green a minute early, 62.7 miles in 65 minutes, and the 69.2 miles to Waterloo Junction were completed in 74¾ minutes instead of the 76 minutes booked. After a halt of 1½ minutes Charing Cross was reached in 79½ minutes from Folkestone. Morley of Ramsgate shed was the driver.

Buffet Cars for G.N.R.(I)

Two new buffet cars have been put into service between Dublin and Belfast on the G.N.R. of Ireland. These are furnished on modern lines and have removable tubular framed chairs. The kitchen compartment is well fitted up to enable refreshments and light luncheons to be served. The cars are constructed with timber body framing finished externally with sheet steel panelling. Overhung suspension gangways are provided and in general the cars are similar in appearance to the steel-panelled stock introduced last year. They were constructed in the Company's works at Dundalk.

The L.N.E.R. "*Green Arrow*" Locomotive

A New Design for Mixed Traffic Duties



THERE appears to be no limit to the originality of Sir H. N. Gresley, the Chief Mechanical Engineer of the L.N.E.R. To introduce successfully such striking designs as his "Pacifics" and freight "Mikados," "*No. 10000*," "*Cock o' The North*" and "*Silver Link*" constitutes a notable record; yet he again breaks new ground in the latest class of locomotive he has introduced. The new engines are of the 2–6–2 or "Prairie" type of which, as a tender design, only a single experimental representative has ever been in use on a British railway. Four of these new engines have been constructed at Doncaster and of these the first, No. 4771, "*Green Arrow*," forms the subject of our illustration. A further 28 are to be built at Darlington.

These engines, which form class "V2" on the L.N.E.R., are intended to form a "general utility" type, supplanting to some extent on certain main line passenger trains and express freight trains the 2–6–0s that have been the recognised engines for such duties for some years. The standard group engines of this type, class K3, were developed from the "1000" series of the former G.N.R. and have rendered excellent service. They are still doing so, but under modern operating conditions there has been an increasing need for locomotives having a greater boiler and fire-box capacity than it is possible to obtain with the 2–6–0 wheel arrangement, and economically more capable of sustained high-speed running. This explains the adoption of the "Prairie" or 2–6–2 wheel type, in which the small trailing wheels render possible the familiar features of Doncaster practice, the wide fire-box, as on the "Atlantics," "Pacifics," and "Mikados," the satisfactory development of the boiler itself and a well balanced distribution of weight. For easy running at higher speeds the driving wheels are 6 ft. 2 in. in diameter as compared with the 5 ft. 8 in. wheels of the K3 "Moguls."

The illustration above, reproduced by courtesy of the L.N.E.R., shows the first of the new 2-6-2 tender locomotives No. 4771, "Green Arrow." The appearance of the new class marks the first application of the "Prairie" wheel arrangement to tender locomotives in this country. They form a development of the familiar "Moguls" and incorporate features developed in recent L.N.E.R. locomotive practice.

The boiler is of the same general design as that of the A3 class "Super-Pacifics," and carries a working pressure of 220 lb. per sq. in. A similar type of steam collector is fitted, consisting of a steel pressing mounted above the barrel, and entrance to it is gained through a number of slots cut in the top of the boiler barrel. The main steam pipe is of generous dimensions, and a 43-element superheater of the Robinson type is provided. As might be expected there are three cylinders, each 18½ in. in diameter, and with a piston stroke of 26 in. The cylinders, steam chests, smoke-box saddle and all steam and exhaust passages are cast as one unit, this monobloc casting design being a special feature of L.N.E.R. practice. Each of the pistons is combined in a single forging with its piston rod, and the drive from the inside and outside cylinders is taken to the middle coupled axle, which is necessarily cranked and of built-up construction.

Piston valves are relied on for steam distribution and those of the outside cylinders are actuated by Walschaerts valve gear. The motion of the inside valve is derived from the outside valve spindles by means of the patent Gresley system of conjugated levers that has been applied so successfully to more than 470 other three-cylinder locomotives on the L.N.E.R. The lubrication of the cylinders and of the coupled wheel axle-boxes is effected mechanically by means of two Wakefield lubricators mounted on the running plate. The leading wheels, 3 ft. 2 in. in diameter, are mounted in a pony truck, which has a side play of 5½ in. to each side, grease lubrication being applied to all links and slides. The trailing wheels, 3 ft. 8 in. in diameter, have their axles carried in Cartazzi axle-boxes, as on the "Pacifics," which give a maximum side play of 2½ in. each side. The curving properties of the leading and trailing wheels and the central disposition of the coupled wheelbase result in a well-balanced flexible locomotive.

The cab design is of interest in that it follows the wedge-shaped formation of the spectacle plate that was first seen on the "*Cock o' The North.*" A particularly good lookout is afforded through the front windows, which are of "Triplex" safety glass. The engine is arranged to be driven from the left-hand side. Hand-operated sanding gear supplies the leading pair of coupled wheels and steam sanding is applied to the centre pair. The sand-boxes are of welded construction, and this also applies to the ashpan.

The tender is a large six-wheeled vehicle similar in appearance to those provided for many of the J39 class 0–6–0s and "Shire" class engines, also the latest 4–6–0s of the "Football Club" series. Its wheelbase is disposed unequally, the centre and rear pair of wheels being spaced closer together on account of the concentrated weight of the water towards the rear. It accommodates 7½ tons of coal and 4,200 gallons of water. Screw-operated water pick-up gear is fitted. The tender weighs 51 tons loaded, and with the engine weight of 93 tons 2 cwt. this gives a total weight in working order of 144 tons 2 cwt. It is interesting to note that the new engines are only seven tons less in weight than the giant booster-fitted 2–8–2s, or "Mikados," Nos. 2393–4, of the same company, which regularly haul mineral trains with loads of 1,600 tons.

The complete engine and tender has a massive yet handsome appearance. It is less revolutionary externally than was "*Cock o' The North*," or "*Silver Link*," yet it has a distinctly modern look about it. A minor innovation is the selection of the side of the smoke-box as the position for the nameplate, there being no splashers above the driving wheels on which the usual curved plate could be mounted. The name itself of No. 4771, "*Green Arrow*," is significant and is well chosen in view of the fast goods duties for which these engines are partly intended. The "Green Arrow" service, as some readers will know, is the specially rapid registered transit for freight that is afforded by the railway companies. An additional charge of 2/6 is made on any consignment sent by this service, whether it is a small package or a complete train load, and the railway companies guarantee delivery on the next day to any town in England, Scotland or Wales.

A Veteran Forth Paddle Steamer

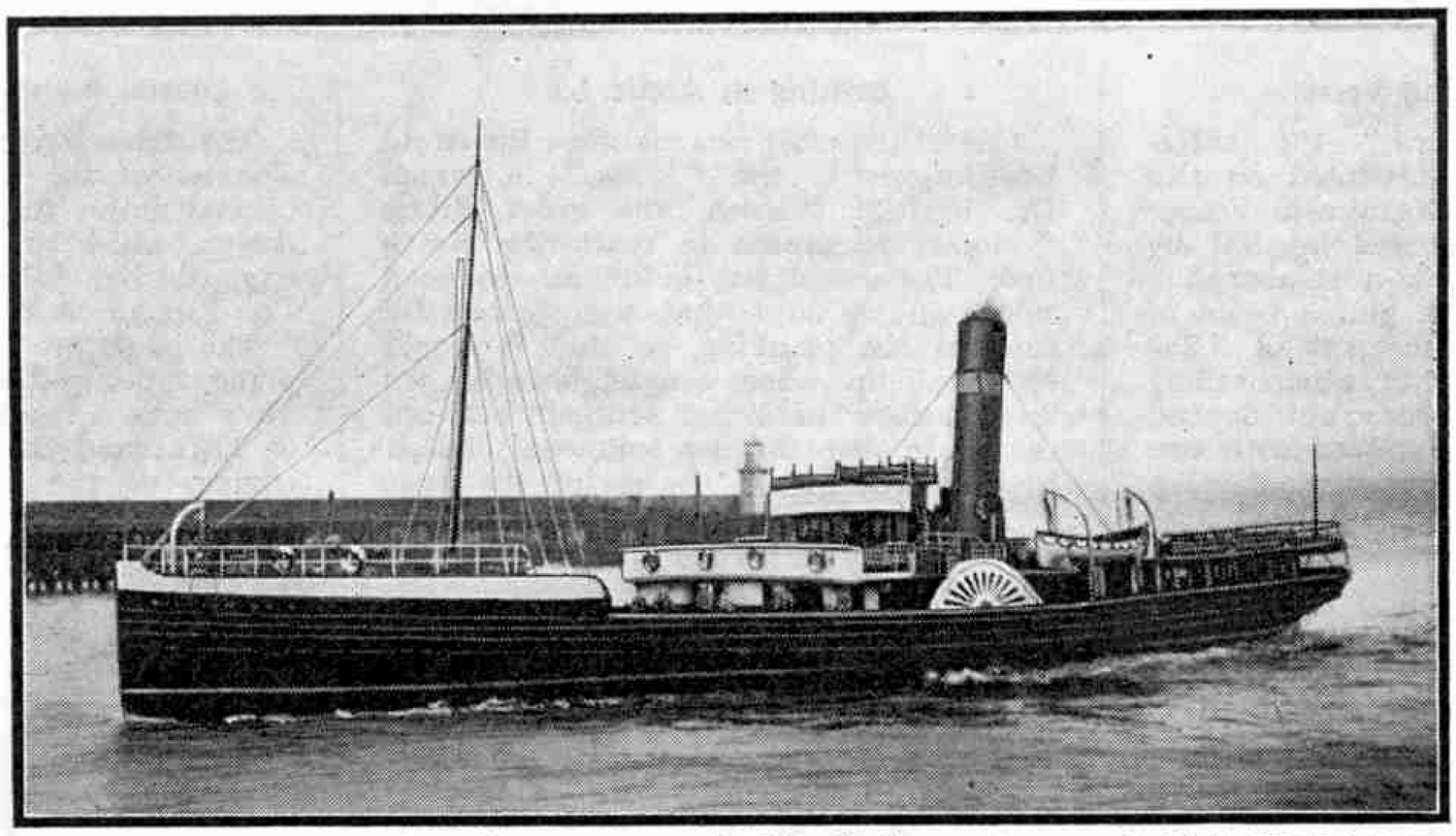
The *"William Muir's"* Great Record

By J. H. Sutherland

ALL who are interested in the vessels that ply in the Scottish firths no doubt were familiar with the *"Columba,"* the Clyde steamer described and illustrated on page 308 of the *"M.M."* for May last, and were aware of her 57 years of service before she went to the ship-breakers.

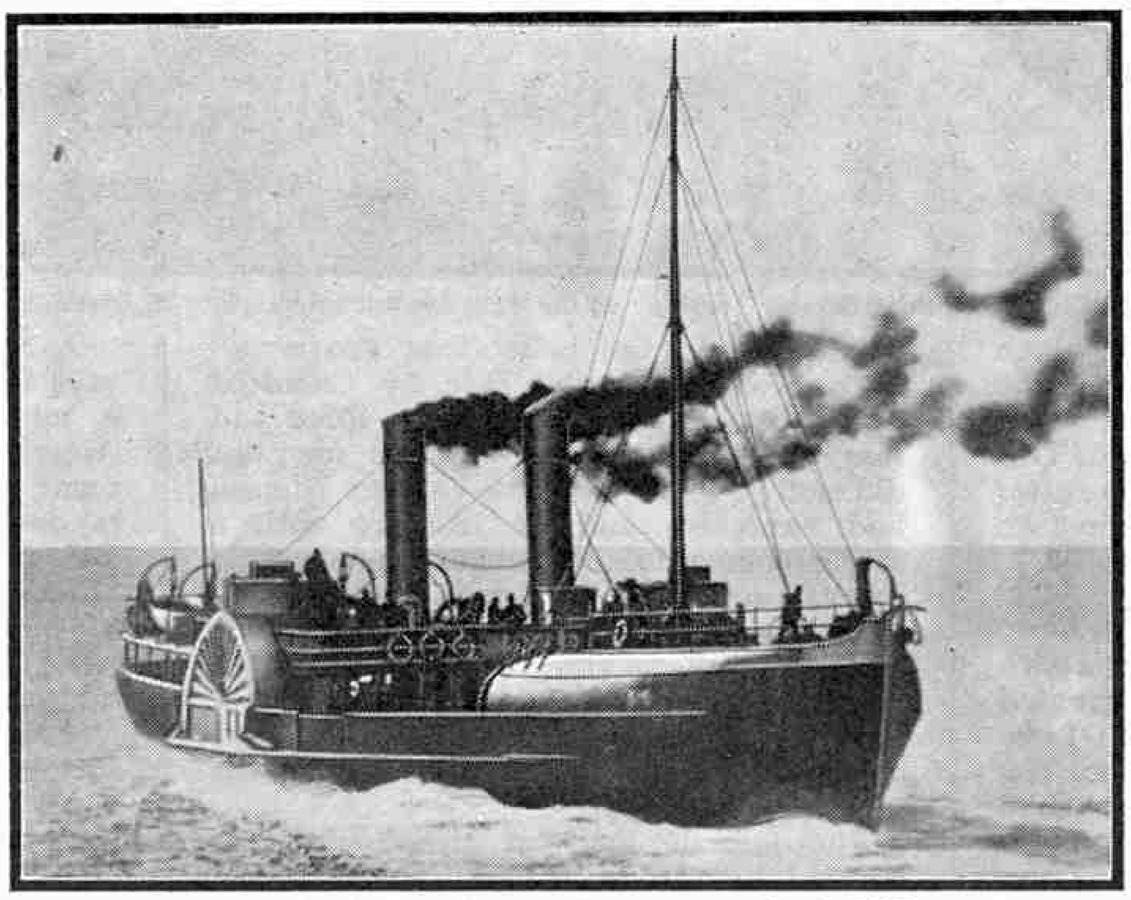
It is perhaps not so widely known that the Forth can present a parallel to the career of this famous ship in that of the *"William Muir,"* a steamer that for 57 years has been as familiar to the people of Edinburgh as the *"Columba"* was to Glaswegians.

Before the Forth Bridge was built the main railway route from Edinburgh to Fifeshire and the North was interrupted by the Firth of Forth, across which a ferry service was maintained by the North British Railway between the ports of Granton and Burntisland, a distance of five miles. At one time as many as four steamers for vehicles and two for passengers were necessary to cope with the traffic on this service, and of these none was more popular than the *"William Muir,"* which was named after a director of the owning railway company.



The "William Muir," the last of the railway steamers maintaining the ferry service across the Firth of Forth between Granton and Burntisland. This veteran has 57 years' service to her credit.

This vessel began her period of long service in 1879. She was launched in that year from Kay's yard, at Kinghorn, in Fife, with full steam up, as was customary in the absence of a fitting-out basin. She was not without her share of good looks, possessing symmetrically placed twin funnels, a deck saloon, a spacious promenade deck and a well-moulded hull capable of weathering the winter storms in the Firth. Except for her rounded, whale-backed forecastle, her lines were those of the typical pleasure steamer. This roofed enclosure provided shelter for steerage passengers and was necessary for the horses and other livestock that were transported regularly.



The "William Muir" before her reconstruction in 1910.

The *"William Muir"* was closely associated with one of the most appalling disasters that occurred in Scotland during the nineteenth century. On Sunday, 28th December, 1879, the year in which she commenced service, she crossed from Granton to Burntisland in the teeth of a hurricane with about 75 passengers bound for Dundee. Not one of these was destined to return, for the central portion of the Tay Bridge collapsed as the train in which they travelled north passed over it, and all lost their lives.

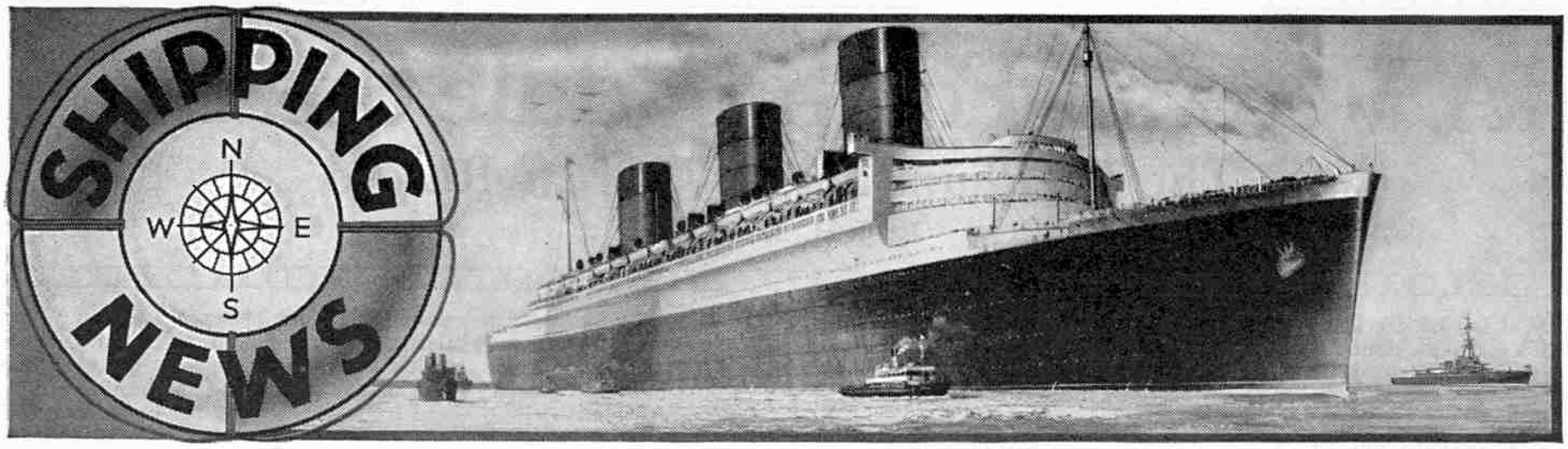
For 13 years the *"William Muir"* shared the ferry duties with the *"John Stirling."* When the Forth Bridge was opened in 1892, the volume of ferry traffic decreased to such an extent that one passenger boat was taken off the service, and the *"William Muir"* alone was left to maintain the connecting link between the two ports.

In 1910, after 31 years of arduous employment, the old stager was re-conditioned at Leith, and on her re-appearance at Granton few would have recognised her if she had not carried the familiar name on her bows. Her two trim black funnels had been replaced by a single tall smoke-stack of greater diameter set abaft the paddle-boxes, and this was painted bright red with black top and an intervening white band, in accordance with the colour scheme of the N.B.R. Clyde steamboats. The disappearance of one funnel meant a gain of deck space forward for the accommodation of vehicles, but the alteration had affected her former harmony of outline.

Changes were made also below decks. There her venerable simple engine had given way to a compound that enabled her to attain a speed of about 16 knots. Her present-day running is more nearly at 10 knots, but now there is no passenger service between Waverley Station, Edinburgh, and Granton, and there is no vital necessity for a speedy ferry passage.

The Forth ferry steamer was designed and built for her special duties and never approached the all-round standard of excellence of the *"Columba."* Of the two the former can boast the more meritorious record as far as actual service is concerned, however. The *"Columba"* spent eight months every year at sheltered moorings, but the *"William Muir"* is in commission seven days a week practically throughout the year. Apart from her overhaul in 1910, and an annual renovation that occupies three weeks, she has therefore spent her 57 years of existence in continuous service.

A few years ago Diesel-electric ferry boats displaced the steamer that used to ply between North and South Queensferry, higher up the Firth, and the *"William Muir"* is the last railway-owned steamboat in service on Forth waters. She is the only remaining link with a service that was busy and famous for almost half a century, and cannot be brought to an end until the Act of Parliament that established it 90 years ago has been repealed. The old craft seems destined to continue her course indefinitely. After her annual overhaul, when the painters make her spick and span, her age would be difficult to conjecture were it not for the old-fashioned alleyways that separate the saloon from the bulwarks. She carries her years lightly, and, when she departs for good, Granton, where she lies overnight, will truly be incomplete without her.



Finnish Training Vessel

The *"Suomen Joutsen,"* the three-masted sailing vessel illustrated on this page, was built at St. Nazaire in France in 1902. She was purchased in 1931 by the Finnish Navy for use as a training ship. With a length of 260 ft. and a beam of 40 ft., she has a displacement of 2,259 tons. As is the case with other sailing ships still afloat, she does not depend only on the wind, but is fitted with two auxiliary Diesel engines that develop 400 h.p. and give her a speed of six knots. Her complement is 27 officers, and 60 cadets.

World's Largest All-Welded Tanker

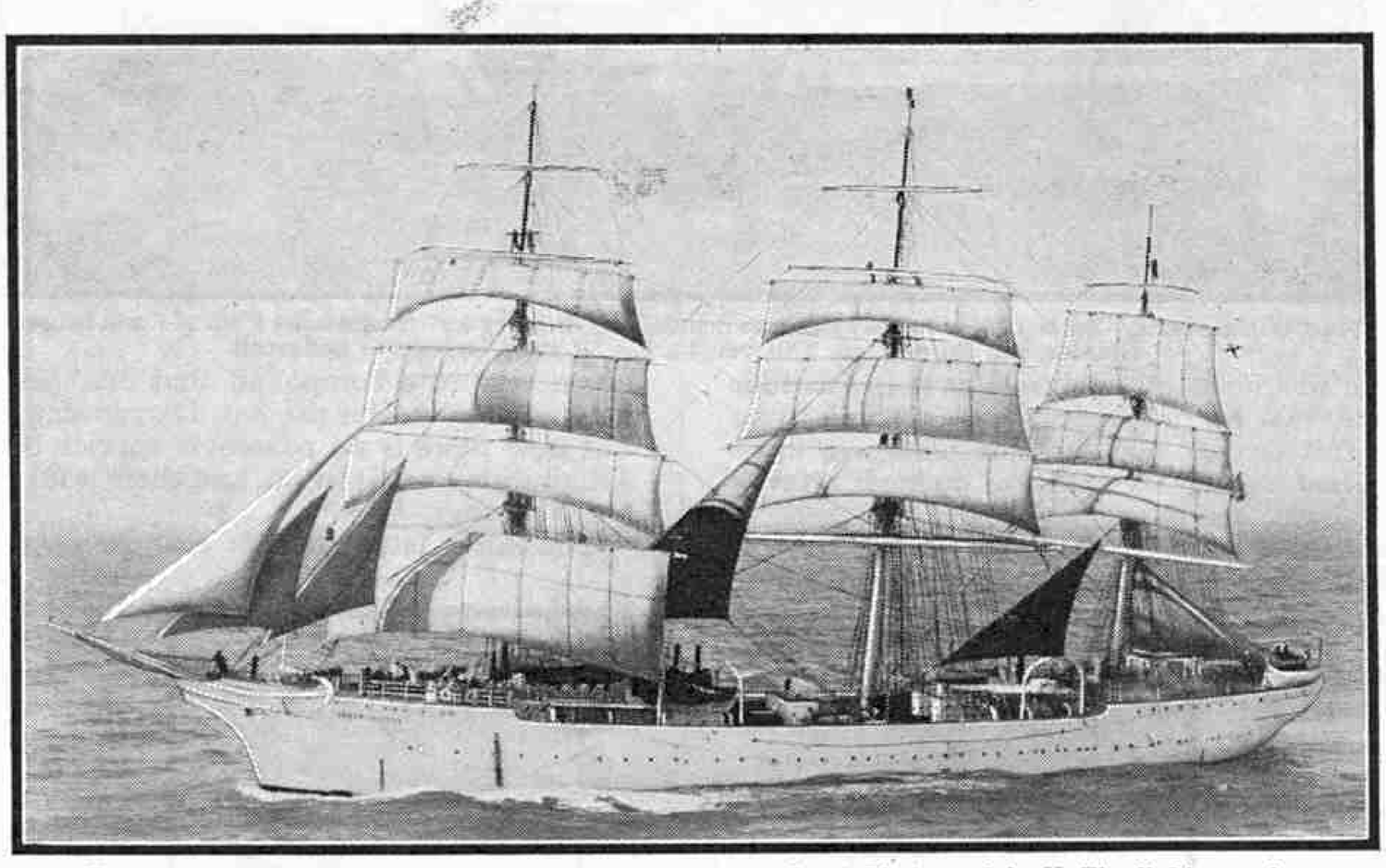
An oil tanker recently put into service in the United States is claimed to be the largest all-welded vessel of this kind in the world. The vessel has been named *"Transoil,"* and has an overall length of 258 ft., a moulded beam 43 ft., and a moulded depth of 16 ft. 4 in. She is propelled by two 475 h.p. oil engines, giving her a speed of 9 knots when loaded.

Another recent addition to the world's fleet of oil tankers is the *"Standella,"* which is the first of 16 tankers being built on the Clyde to the order of companies associated with Scottish Oils and Shell Mex, Ltd. This vessel has been delivered to her owners after successful trials. The orders represent an expenditure of more than £2,000,000.

Motor Boat Records Broken

A world speed record for motor-boats with engines of 1,500 c.c. was recently created by Carmagnani, an Italian, who on Lake Maggiore covered a mile in 59 4/5 sec. The average speed in the runs that gave Carmagnani the record was 69 m.p.h.

The record for the highest speed ever attained by a motor-boat with a displacement of less than 350 k.g., or about 770 lb., stands at 74.4 m.p.h. It is held by Jean Dupuy, and there is some speculation at the moment as to whether he will break his own record within the next few weeks, as he has just had built a remarkable outboard craft, which is fitted with two Soriano engines each developing 110 h.p.



The Finnish training ship "Suomen Joutsen" off the Manx Coast. Photograph by H. Elwell, Liverpool.

Drifting in Arctic Ice

One of the most famous ships the world has known is the *"Fram,"* in which Dr. Fridtjof Nansen, the great Arctic explorer, attempted to reach the North Pole. The vessel was built with rounded sides, and a keel that was practically sunk in the planking, so that it would be lifted up when caught between ice floes instead of being crushed between them. In her Nansen allowed himself to be imprisoned in the ice off the coast of Siberia, in the belief that she would be carried across the Pole by the drift of the ice. She spent between three and four years in the grip of the ice, but did not go as near to the Pole as Nansen had expected, and he left her with a single companion to make a memorable journey across the ice in which he attained what was then a farthest north record. The *"Fram"* meanwhile had drifted to Spitzbergen, where she was released from the ice, and then returned to Norway. She had been considerably farther north than any other vessel.

The famous drift of the *"Fram"* is recalled by the news that another vessel is being designed in the Arctic Institute, Leningrad, for the same purpose. This will have a displacement of 1,000 tons, and will be fitted with a 400 h.p. oil engine and sails. The egg-shaped hull and the removable rudder and screw of the *"Fram"* are being reproduced in her, and she will be towed into high northern latitudes by an ice-breaker in order to commence her Arctic drift.

Coastal Motor Torpedo Boat Trial

The trials recently took place on the Thames of the first of a batch of fast coastal motor torpedo boats of improved design, which are being constructed and engined by John I. Thornycroft and Co., Ltd. for a Far Eastern Government.

The boats are of the single-step hydroplane type, and are built of mahogany. They have a length of 55 ft. and a beam of 11 ft., and the two 12-cylinder petrol engines of the latest Thornycroft type with which they are fitted have a total designed output of a little over 1,000 h.p. The engines are placed side by side, and an auxiliary cruising engine is coupled to one of the main engine shafts.

The trials were carried out with the boat in service conditions, loaded with the equivalent of two 18 in. torpedoes, two depth charges, machine guns and ammunition, and wireless equipment. The average speed over six runs was more than 45 knots.

A Mile a Minute Ambulance Boat

A streamlined motor ambulance boat said to be capable of a speed of a mile a minute has just been completed in America for the Portland Fire Department, Oregon. The hull of the vessel is described as aerodynamic in design. Below speeds of 30 m.p.h. it behaves normally, but at higher speeds lifting forces come into play and cause it to rise. At about 45 m.p.h. most of the hull of the craft is clear of the surface, and at 60 m.p.h. only the central keel section is in contact with the water.

An interesting feature is that below the waterline the hull is given the shape of an inverted "V." At high speeds the air in the hollow in the vessel's bottom is said to produce an air cushioning effect.

* * * *

Voyages by the Union Castle Line between Southampton and Capetown will be reduced from 17 days to less than 14 days this month, when the *"Athlone Castle"* will join the *"Stirling Castle,"* described in the *"M.M."* for May, and other liners that have undergone engine alterations.

"*Queen Mary's*" Steering Gear

The rudder of the "*Queen Mary*" weighs more than 140 tons, but the steersman on the bridge, more than 1,000 ft. away, can move it with ease by merely turning a small steering wheel. The massive electro-hydraulic steering gear that makes this possible is shown in the lower illustration on this page. It was built by Brown Bros. and Co., Ltd., of Edinburgh, and the figures seen behind it in the illustration give some idea of its immense size. It is indeed the largest ever installed in an ocean liner. Its weight is about 180 tons, and the power it exerts is approximately three times that of the largest gear previously built in this country.

This complicated steering gear is required to multiply the power exerted by the helmsman. The movements of the wheel control pumps that supply oil fluid to cylinders in which slide four cast steel main hydraulic rams. These can be seen in our illustration, arranged in pairs with two swivel crossheads, one on each side of the rudder stock, that transmit their movements to the arms of the tiller. The pumps used were manufactured by The Variable Speed Gear Co., Ltd., Elswick, and automatically provide the pressure fluid in the exact quantity required to move the rams to the extent indicated by the movement of the steering wheel.

There are two independent steering wheels on the bridge, and in addition there is one on the docking bridge near the bows, and three others placed on pedestals in different places. The gear can therefore actually be controlled from any one of six distinct wheels.

Motor Launches for River Police

The upper illustration on this page shows one of two Diesel-engined motor launches recently supplied to the Metropolitan Police by the Sittingbourne Shipbuilding Co., Ltd., Kent, for use on the Thames. Each boat has a length of 28 ft., a beam of 7 ft., and a draft of 2 ft. 3 in. They are constructed of teak planking on an oak framing, and are of round-bottom section. An A.E.C. six-cylinder oil engine is fitted. This develops 100 h.p. at 1,650 r.p.m., or 125 h.p. at 2,000 r.p.m., and gives the boats a maximum speed of 15 knots.

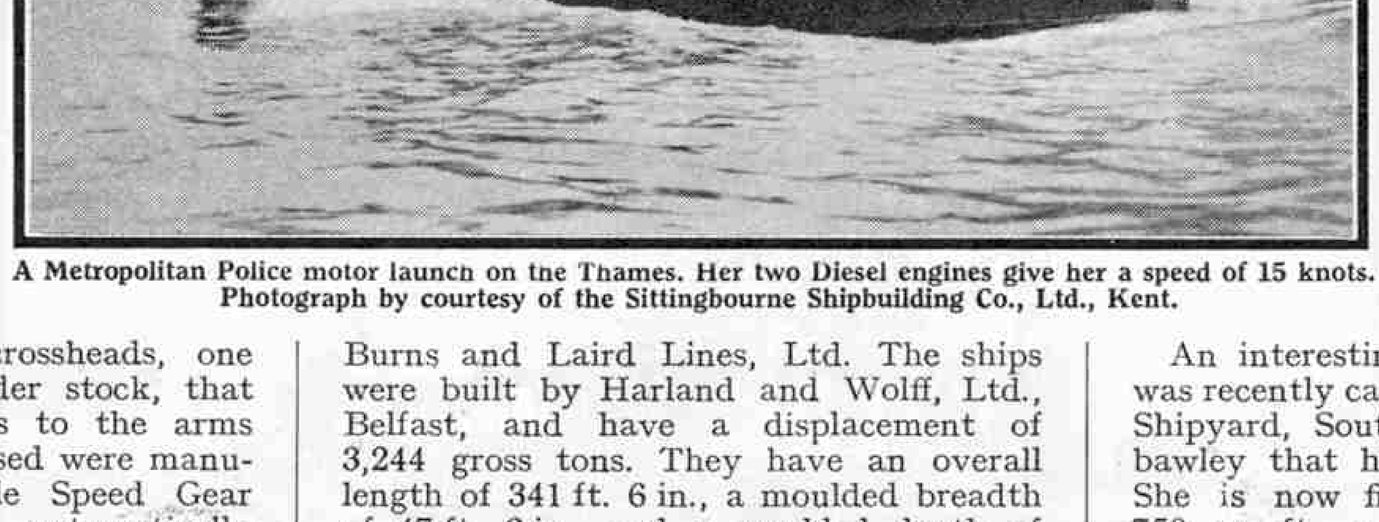
* * * *

A recent motor boat race at Oulton Broads, was started by Gar Wood by wireless from his home in Detroit. He first gave a short speech which was broadcast to competitors and spectators.

New Motor Vessels for the Belfast-Glasgow Service

Two new twin-screw motor vessels, the "*Royal Ulsterman*" and the "*Royal Scotsman*," recently took up service on the Belfast-Glasgow service of the Burns and Laird Lines, Ltd. The ships were built by Harland and Wolff, Ltd., Belfast, and have a displacement of 3,244 gross tons. They have an overall length of 341 ft. 6 in., a moulded breadth of 47 ft. 6 in., and a moulded depth of 17 ft. 9 in., and their service speed is about 15½ knots.

The Harland-Burmeister and Wain two-stroke oil engines fitted in each of the vessels have a total designed output of about 5,500 h.p. They are eight-cylinder units with a bore of 500 m.m. and a stroke of 900 m.m. Poppet exhaust valves are incorporated and heat from the exhaust gases is recovered by using it in a special boiler.



A Metropolitan Police motor launch on the Thames. Her two Diesel engines give her a speed of 15 knots. Photograph by courtesy of the Sittingbourne Shipbuilding Co., Ltd., Kent.

Streamlined Ferry Steamer

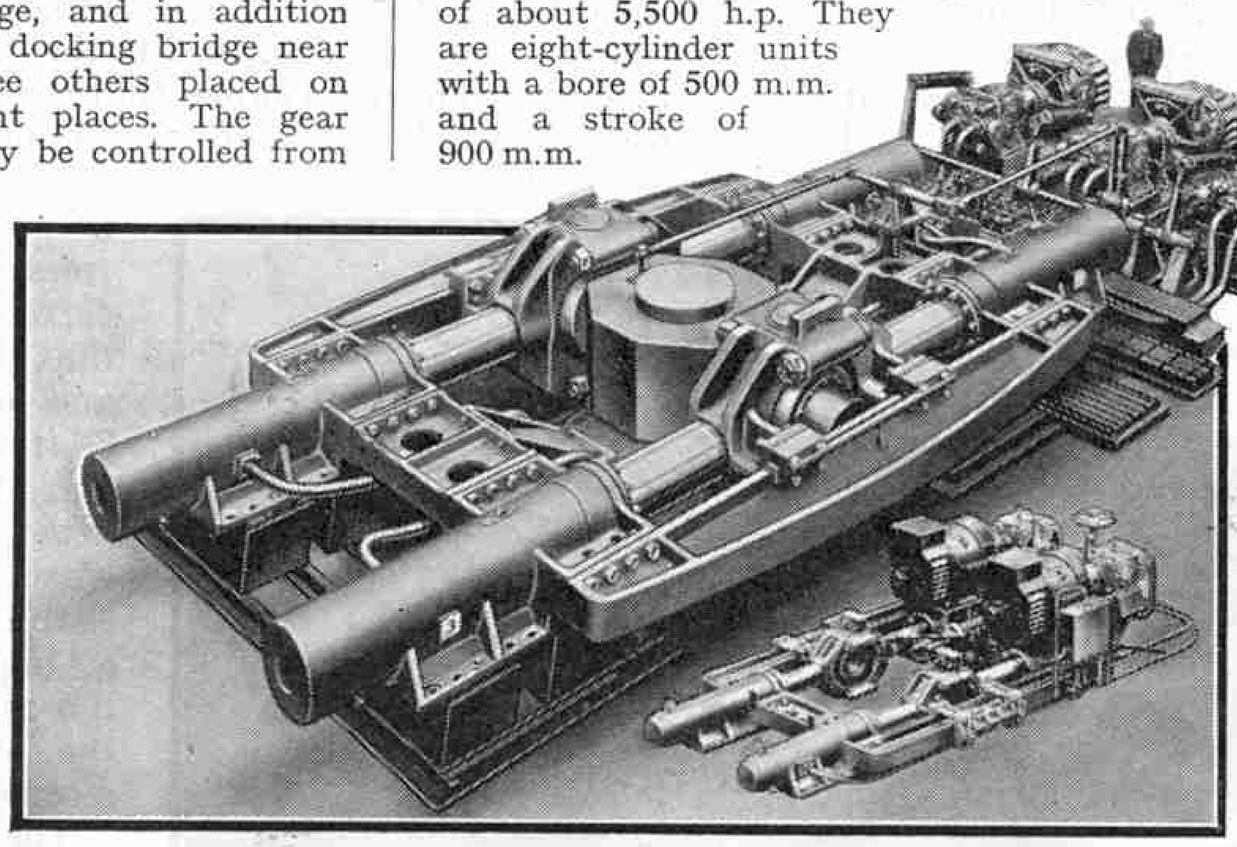
A ferry boat that is completely streamlined is being completed for the Virginia Ferry Corporation in the United States. The vessel has an overall length of 260 ft., a breadth of 59 ft. and a depth of 19 ft. It is constructed entirely of steel, and the streamlining includes the entire superstructure and funnel.

Leigh Bawley Becomes a Yacht

There are many types of fishing craft to be found round British coasts, each designed to operate in the conditions peculiar to their customary fishing grounds. Among these is the Leigh "bawley," which is built for shrimping and whitebait fishing in the Thames Estuary. This craft is locally built at Leigh-on-Sea, and can be distinguished by its characteristic high, straight stem and its wide, flat, transom stern. Both features are designed to fit this type of vessel for its work in the Estuary. Another peculiarity is the short lower mast and long top mast.

The number of bawleys in operation has greatly diminished during recent years, for while there were about 72 in 1914, two years ago there were only 22. Several have been converted into yachts, and in its new form the bawley is ideal for those who wish to acquire a seaworthy boat at less cost then would be involved in buying a new yacht.

An interesting conversion of this kind was recently carried out by the Underwood Shipyard, South Benfleet, Essex, with a bawley that had seen 35 years' service. She is now fitted with a cutter rig of 750 sq. ft., and a two-cylinder poppet-valve Kelvin engine, developing 13 h.p. at 550 r.p.m. on paraffin, has been installed in a separate compartment in the stern. The fish hold has been transformed into a cabin, and in its new form the old vessel provides comfortable accommodation for seven persons.



The steering gear of the "Queen Mary" side by side with that of a medium-sized passenger vessel. Both were built by Brown Brothers and Co., Ltd., of Edinburgh, to whom we are indebted for our illustration.

Channel Steamer's Stabiliser

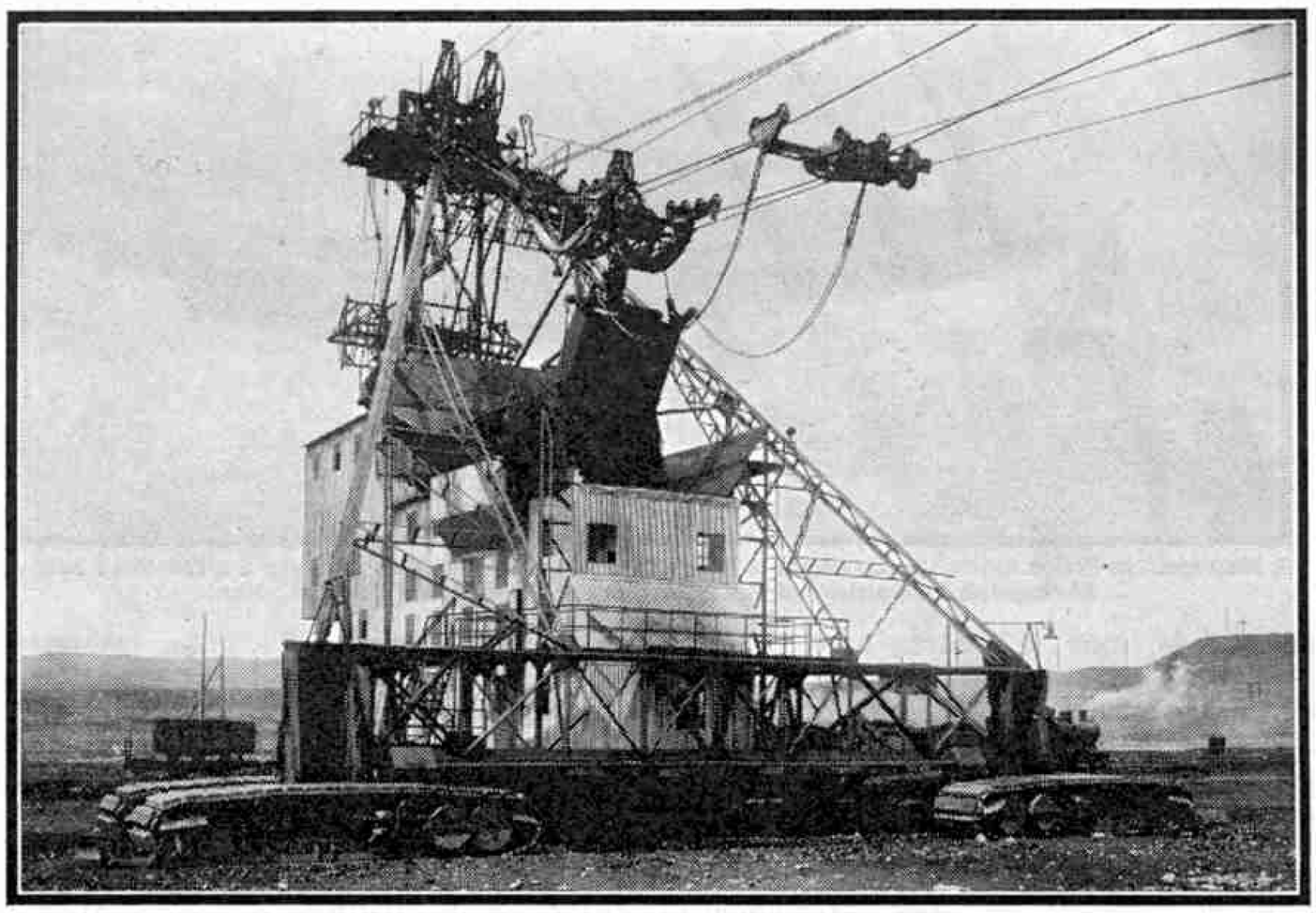
The Southern Railways newest channel steamer, the T.S.S. "*Isle of Sark*," a vessel of 2,211 tons, has been fitted with the "Motora" stabilising system. Her first voyage with the new equipment was made early this year with satisfactory results.

The device consists of fins projecting into the water from the side of the hull at about the turn of the bilge. These fins are under the control of a gyroscopic detector and relay, and as the ship rolls, that on the side descending rises, while the one on the opposite side of the ship turns downward. The forward motion of the ship causes the water to exert an upward force on the fin tilted up on the descending side and a downward force on the fin tilted down on the side of the ship moving upwards, and the couple thus created acts to restore the ship to an even keel. As she recovers the fins resume their normal position, and as she heels over on the opposite side they reverse their tilt. When their stabilising action is not required the fins can be withdrawn into recesses inside the hull.

Cableway Drag-Line Excavators

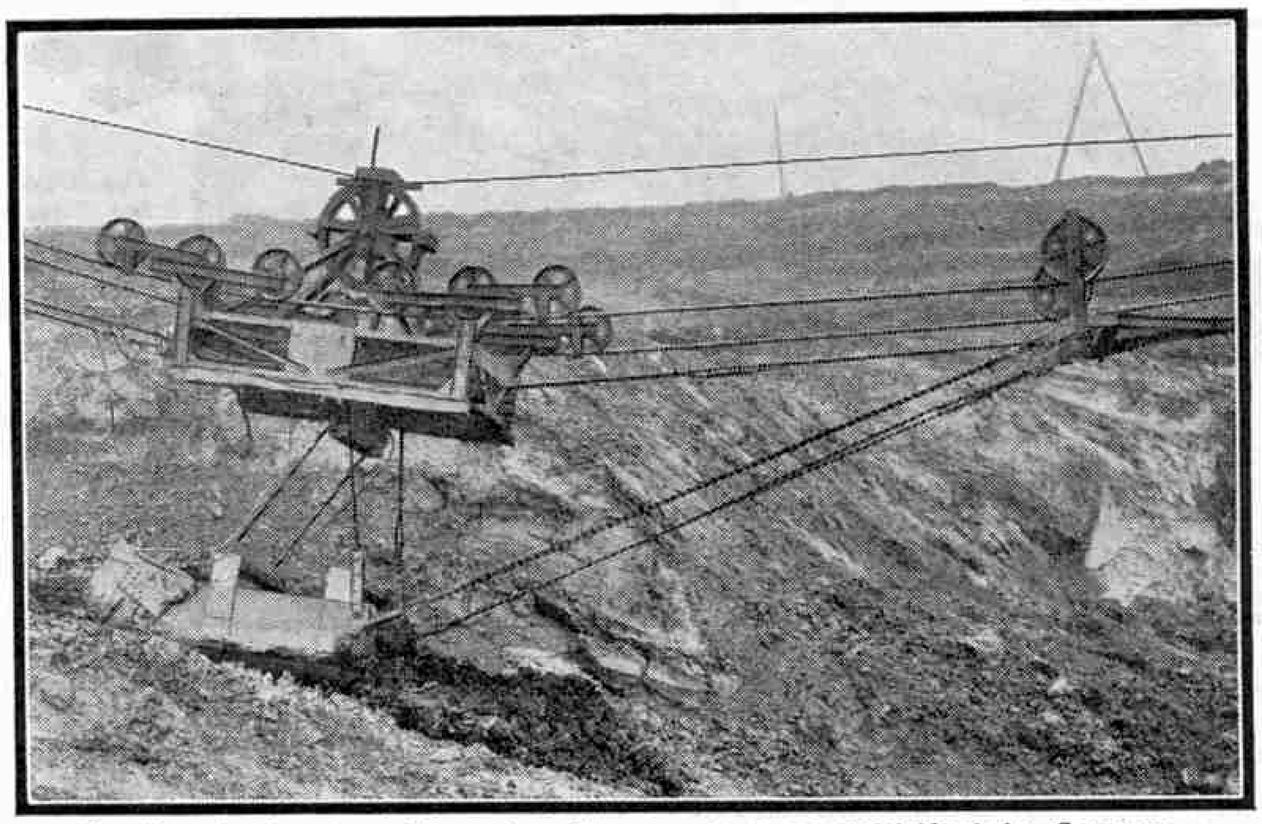
Giant Machines for Open Pit Mining

ONE of the chief reasons for the leading position that Great Britain holds in the modern industrial world is that she has under her soil an immense store of hard coal that is an ideal fuel for industrial purposes. Other countries are not so fortunate in this respect, and in many of these the chief natural fuel supplies take the form of lignite, or brown coal, which represents an intermediate stage between wood and coal. This is soft compared with the coal with which we are familiar, and usually is comparatively light, friable and porous. Its heating value is very low, and when lighted in an open grate it smoulders, but it can be burned with little difficulty in specially designed grates using some form of forced draught.



General view of the tail tower of a cableway drag-line, showing the bucket discharging fuel into a crusher. We are indebted to Bleichert-Transportanlagen G.m.b.H., Germany, for the illustrations to this article.

Brown coal is not obtained from deep pits reached by shafts. It is found comparatively near the surface, at depths ranging from only a few feet to perhaps 200 ft., and usually is extracted by stripping off the covering layer of soil, or overburden, and then digging the fuel itself out of the open pit. There are immense deposits of this kind in many parts of the Earth, notably in Germany, where it is largely used in industry, in North America, and at Yallourn, Victoria.



The digger bucket of a cableway drag-line excavator in use at Wolfersheim, Germany.

The fuel is only economical when cheap mechanical methods of extracting it are used, and giant machines of many types therefore have been devised for use in the open pit mining by which it is won. These include powerful electric shovels and bucket excavators, for the material is sufficiently soft to be dug up readily by appliances of this kind, but in many ways cableway drag-lines are the most interesting of the machines employed. These are literally land dredgers. The excavating bucket is suspended from great cables that may be up to a quarter of a mile in length, and is dragged through the coal, which is scooped up in it and hauled to one of the towers supporting the cables. There it is dumped or delivered into wagons, and the bucket is hauled back to dig up another load.

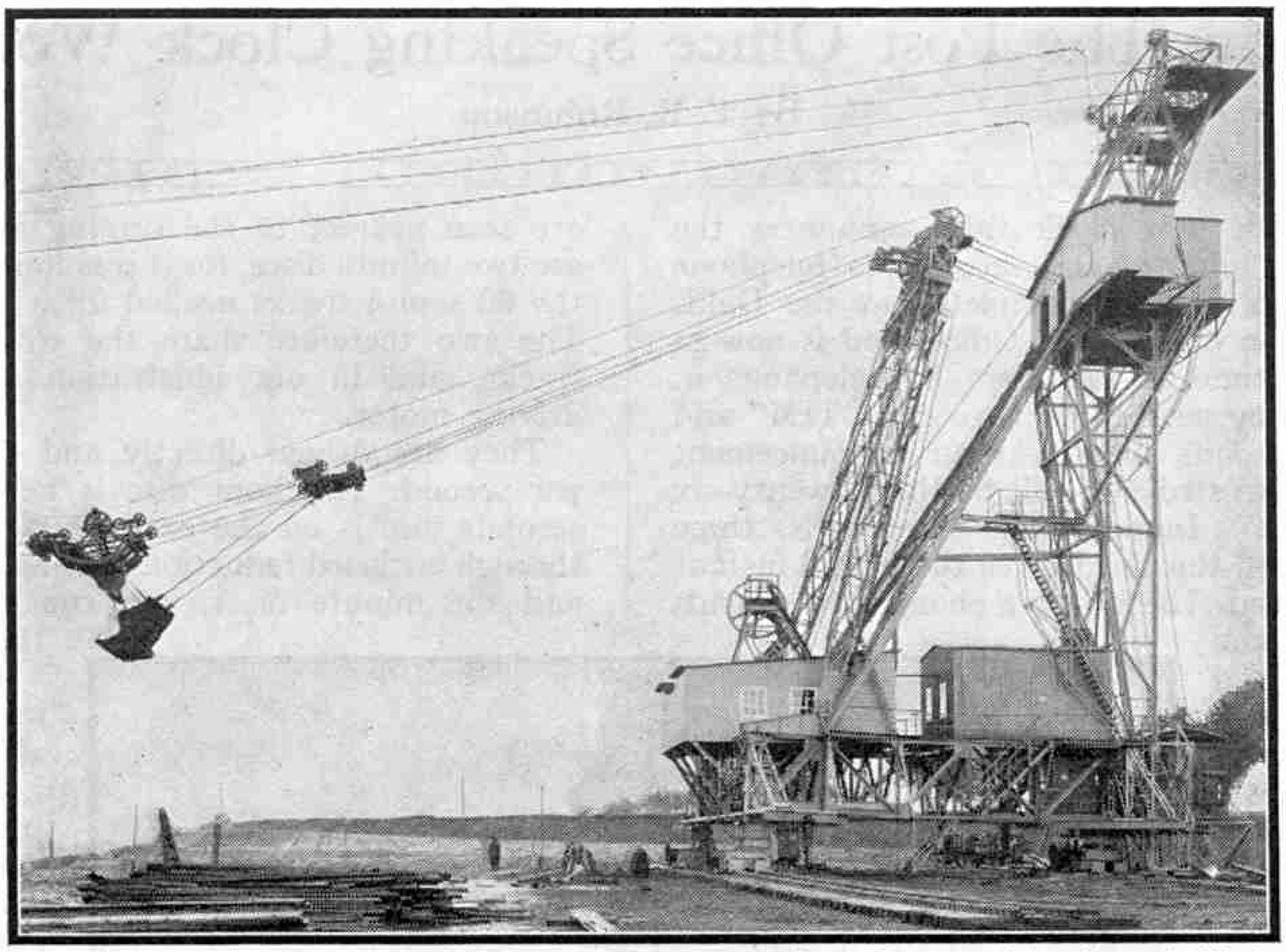
A great area can be swept free of brown coal in this manner, or the covering layer of clay can be removed, as easily as mud can be dredged from the bottom of a lake or estuary. One advantage of the machine is that it not only digs out the coal or soil from the open workings, but also lifts it and carries it away in a single operation.

It will be seen that these giant machines combine the features of drag-line excavators, of the type that have often been described in the "*M.M.*," with those of cableways. The main cables that stretch across the open pit are supported at their ends by immense towers built of steel. These are known as head and tail towers respectively. The former carries the machinery that operates the bucket and may be as much as 60 ft. to 80 ft. in height, and the latter often is fitted with a bunker in which large pieces of coal are broken up, and a hopper from which the material is fed into the wagons waiting to receive it.

The towers are movable, and are carried on bogies with creeper tracks of large size. The usual plan is to make use of triple tracks for each tower, and the size of these can be gauged from the upper illustration on this page.

When the drag-line is at work the towers remain in one position held firmly by means of anchors or hold-fasts, until the long strip beneath the cables has been worked to the required depth. Then one of them is moved so that the

bucket covers fresh ground, or if necessary both are made to travel sideways. The use of creeper tracks enables this to be done readily, and these have the further advantage that towers mounted on them can travel up gradients as steep as 1 in 15. Very little levelling therefore usually is necessary when a pit is being opened out, or when a change in the scene of operations becomes necessary. Some of the earlier drag-line excavators had their towers mounted on rails. They were not so easily adaptable as those now in use, and could not travel on such severe gradients.



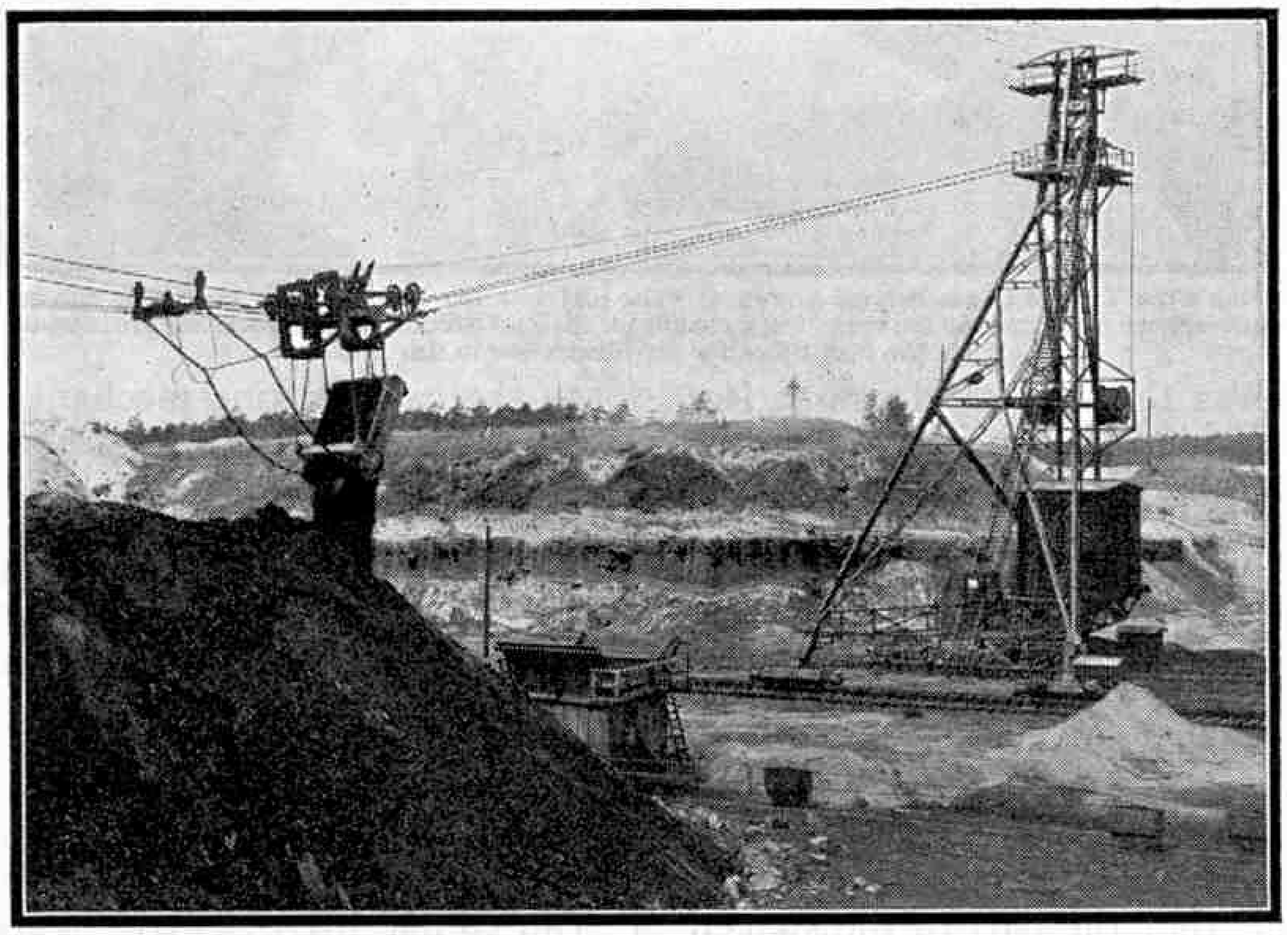
The head tower of an excavator at the Altenbury workings in Borken, Hessen. The span of the cableway is 355 yds.

The excavating bucket of one of these giant excavators may hold as much as 15 cu. yds. of coal. It is carried by a travelling cradle that is suspended from the main cables, and can be pulled backward or forward by means of operating ropes. At the head tower the main cables pass over the top of a jib that can be raised or lowered as required. When the machine is working the jib is first lowered, causing the main cable to dip. The bucket is thus brought into engagement with the ground, through which it cuts its way as it is dragged along by the hauling cable. When it is full it is lifted from the ground by raising the jib, and is then pulled to the head tower or the tail tower to deposit its contents.

The movements throughout are controlled from an operating room in the head tower, in which are installed the winches by means of which the cables attached to the jib and to the cradle are hauled in. The work of lifting the jib is made easier by providing it with a counterweight. All the winches are electrically driven, and separate motors are employed for the different motions. In one excavator in which a bucket of 15 cu. yds. capacity is used, the motor that pulls it through the coal is of 345 h.p., while other motors of 380 h.p. and 275 h.p. respectively are employed for pulling the load along the cable and raising the jib. The discharge of the spoil from the bucket also is automatic and is controlled from the head tower; in this case a 25 h.p. motor operates the mechanism that brings this about.

The speed at which the bucket is dragged through the coal usually is 60 yds. per min., and hoisting and lowering take place at similar speeds. These movements are short in comparison with the distance travelled by the bucket when full, or when returning empty after discharging, and comparatively little time would be saved by speeding them up. The rate at which the bucket travels along the cable has been greatly increased since these excavators were first introduced, and is now from 300 to 400 yds. per min. when full and 500 yds. per min. when empty.

The entire operation of filling the bucket, raising it, and returning it to the ground after emptying its contents where required occupies from two to three minutes, and of this time only 10 sec. are spent in the actual excavation. The output of cableway drag-line excavators usually is very large, however, and is about half as much again as that of mechanical shovels employing the same number of attendants. Normally only three men are required to a drag-line. These are a driver in the control room of the head tower, a signaller in the pit who communicates with the driver by telephone, and a greaser. Possibly a fourth man may be required to manipulate the tracks on which the tail tower moves.



A cableway drag-line excavator at work removing debris at the Görlitz Pit, Silesia.

An interesting feature of the use of cableway drag-lines in open pit mining is the manner in which flooding is dealt with. Surface water is bound to be encountered in open pit working, and this would form a considerable handicap if it were allowed to spread through the mine. For this reason strips of ground are left intact between successive excavations in which water accumulates. These strips act as bars or dams, and prevent the flow of water from one section to another as the depth of the pit is increased.

These giant excavators also can be used with advantage for digging out deposits of gravel, sand and sandy clay that contain gold, tin and other valuable products.

Time By Telephone

How The Post Office Speaking Clock Works

By T. R. Robinson

A REMARKABLE new clock that announces the time in hours, minutes and seconds to telephone subscribers has recently been completed at the Dollis Hill Research Station of the Post Office, and is now in service telling the time to enquirers by telephone in London. All that they need to do is to dial "TIM" and listen. In a few seconds they hear an announcement such as, "At the third stroke it will be three twenty-six and forty seconds." Immediately afterwards three "pips" are heard, and the third gives the actual instant of the time announced. The wording changes 10 seconds later, so that those who then ring up are told that at the third stroke it will be "three twenty-six and fifty seconds."

The speaking clock is at work continuously. Its announcements are changed in this manner every 10 secs., and of course alterations in the minute and hour are made when required. A subscriber is cut off automatically after listening for from 90 to 180 seconds.

The words announcing the time in this new service are spoken in the voice of Miss Ethel Cain, but actually come from recorded sound tracks on a series of glass discs that are revolved by a special electric motor. Miss Cain was the successful competitor in a special contest to decide who should make the records, and she has become widely known as "The Girl with the Golden Voice."

Miss Ethel Cain, who has become known as "The Girl with the Golden Voice," speaking into the microphone when making the sound track records for the Post Office speaking clock. We are indebted to the Post Office for the illustration to this article.

The main mechanical part of the clock is shown in the illustration on the next page, in which the discs and their driving motor can be seen. Each disc has on it sound tracks, similar to those on "talkie" cinematograph films, and alongside them is a small lamp. The beam from each lamp passes through the corresponding disc, and falls on a photo-electric cell opposite. The recordings thus interrupt the light and cause the current in the cell to vary, with the result that the part of the spoken phrase represented by the part of the sound track opposite the light ray is reproduced in the receivers of listening telephones.

Separate discs are used for the hours, minutes and seconds announcements, and each complete phrase does not come from one disc alone, but is built up by cleverly fitting together the currents from the photo-cells alongside all of them. In the illustration, the minute discs are seen nearest to the driving motor. There actually are two minute discs, for it was found impossible to place the 60 sound tracks needed for a full hour on one disc. The two therefore share the work, each carrying 30 tracks, and in our illustration are seen nearest the driving motor.

They are driven directly and each makes one turn per second. The hour disc is next to them, and the seconds disc is on the extreme right. These are driven through enclosed reduction gearing placed between them and the minute discs, and run at half the speed of the latter.

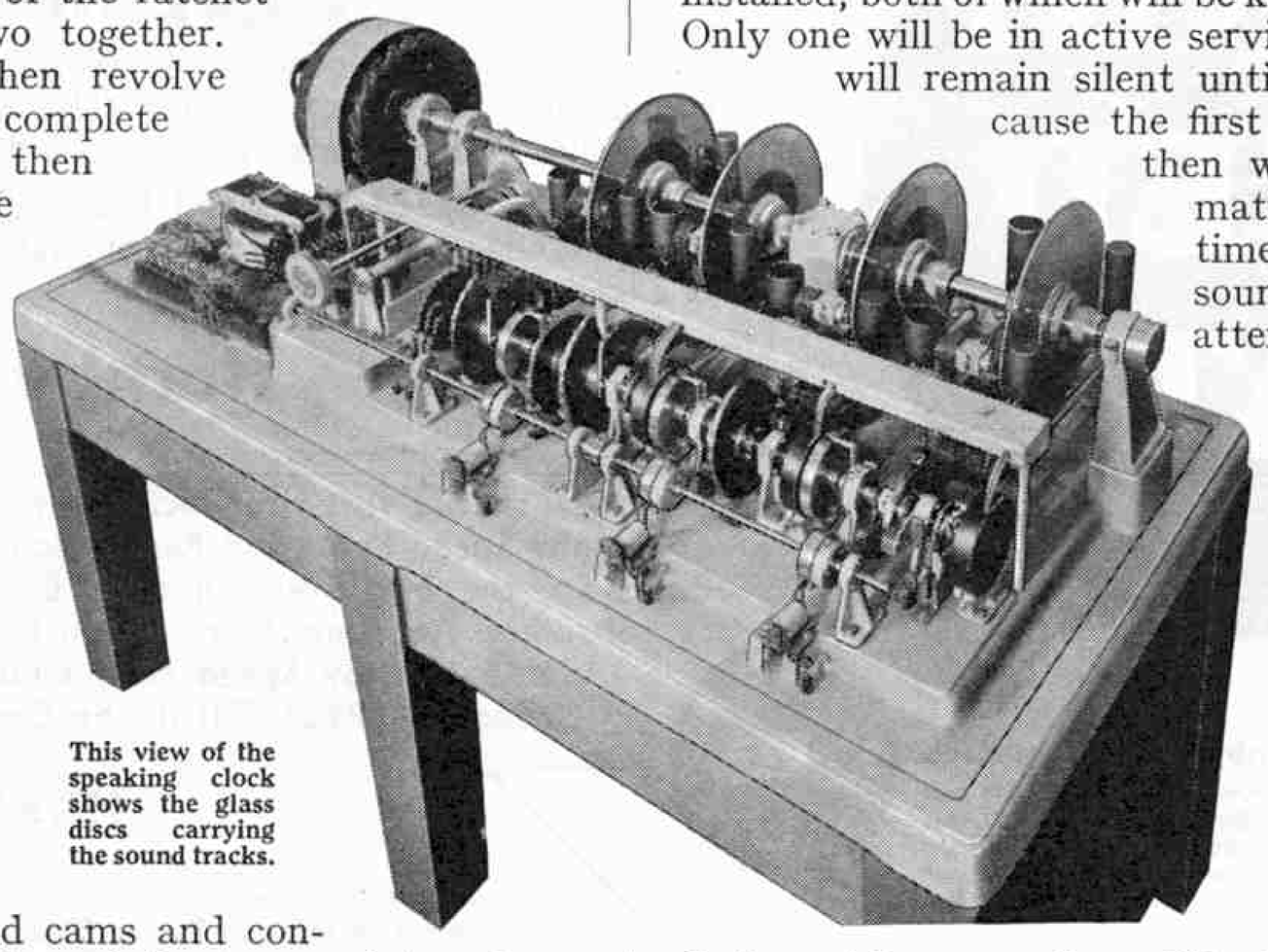
In addition to rotating the discs, the motor also brings about the necessary changes of position of the lamps and photo-electric cells. The two shafts and skew gears that can be seen close to the motor are concerned in this movement. They act through a set of cams to move the carriers on which the lamps and cells are mounted, and thus to bring them into line with the correct sound tracks on their respective discs. The long shaft that in the illustration can be seen mounted in brackets across the front of the bed-plate rotates continuously, and is coupled to the cam-shifting mechanism by a simple trip release at the exact moment when a change of position is required.

The cams are in a row between the shaft and the discs, and attached to each is a ratchet wheel having as many teeth as there are steps on the cam. Stepping the ratchet one tooth therefore moves the cam one step, and changes the associated carrier, lamp, and cell to a fresh track on the disc.

The stepping mechanism for the ratchets consists of a small eccentric that runs loosely on the continuously rotating shaft driven by the motor, and a trip that can couple the eccentric to the shaft when the moment to change the lamp position occurs. The trip itself is an ingenious mechanism and is shown diagrammatically in the lower illustration on the opposite page. The motor driven shaft, which normally revolves idly, is marked A, and carries the ratchet wheel D fixed to it. The sleeve B is attached to the eccentric that steps the cam ratchet, and is stationary until the moment for a change arrives. On this sleeve is the pawl C, and this

is held out of engagement with the ratchet by its tail, which rests upon the tip of the armature F of the release magnet E.

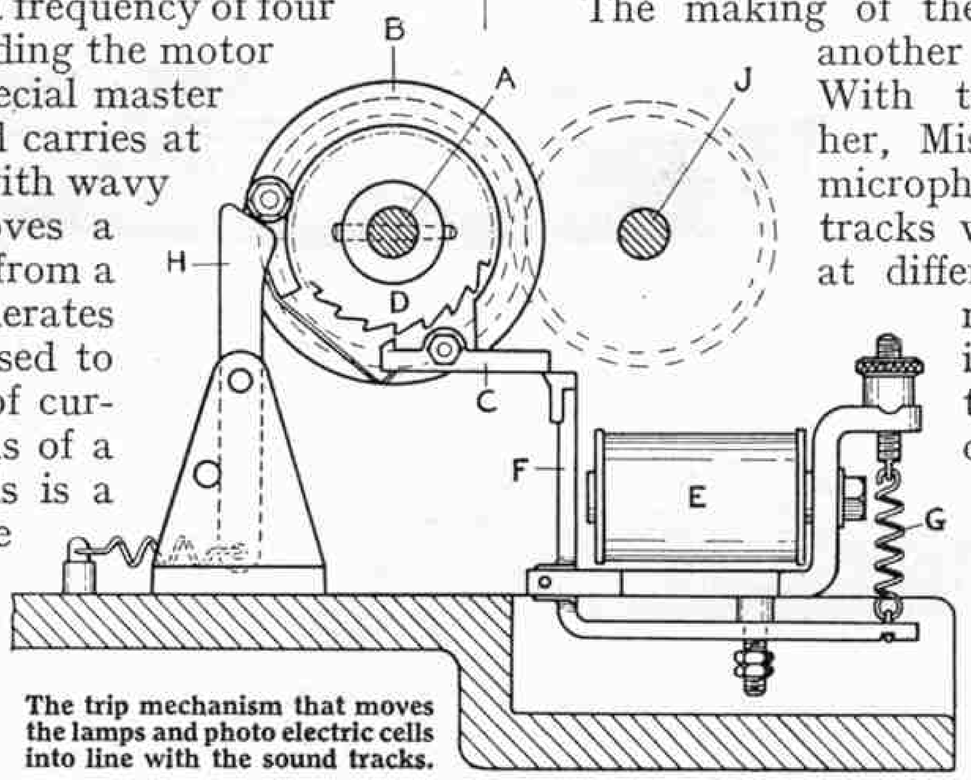
When the magnet attracts its armature, it withdraws the tip from under the tail of the pawl, and the latter then falls into the teeth of the ratchet wheel and locks the two together. The shaft and sleeve then revolve until they have made one complete turn. The tail of the pawl then again catches the tip of the armature and is knocked out of engagement with the ratchet wheel, the shaft being thus released to continue its idle motion. The spring-loaded safety catch H is fitted to act as a further guard, and to retain the tail of the pawl in contact with the armature tip.



This view of the speaking clock shows the glass discs carrying the sound tracks.

Three of these trips are fitted to the clock, one each for the hour, minute and seconds discs, and carefully timed cams and contacts control the energising of the appropriate release magnets. The two fixed lamps and cells that can be seen at the rear of the clock close to the first and fourth discs are used to give the "pips" and the words "At the third strike," which of course are common to all the announcements.

The accuracy of the clock depends on careful control of the speed of the driving motor. This is a special synchronous machine of the 8-pole type, arranged for separate excitation, and runs at the correct speed when it is connected to a supply having a frequency of four cycles per second. The current feeding the motor is generated by the swing of a special master pendulum that beats seconds, and carries at its lower end a transparent slide with wavy blackened portions. As this moves a varying amount of light is passed from a lamp to a photo-cell, and there generates a current that is amplified and used to feed the motor. This generation of current to operate a motor by means of a pendulum and photo-electric cells is a distinctly novel scheme, and one that seems to possess great possibilities in many directions.



The trip mechanism that moves the lamps and photo electric cells into line with the sound tracks.

By a clever arrangement, the very current generated by the swing of the pendulum also is employed to keep it swinging, for as soon as the swing of the pendulum becomes too small the current fed to a pair of condensers becomes unbalanced, and an energising magnet then automatically restores the pendulum to its original arc. The pendulum also is checked if it swings too far, and the Greenwich time signal automatically speeds up or slows down its swing as necessary.

The current that flows through the photo-cell circuits is not powerful enough to be fed directly to subscribers' lines, and has to be amplified. It is then carried to a multiple contact board that allows up to 100 enquirers to obtain the time simultaneously. This ensures that in all normal times those calling will not have to wait, but will be connected at once. The clock has been installed at the London Tandem Exchange, Holborn, and really forms an additional exchange devoted to the distribution of time signals. Two clocks actually are installed, both of which will be kept running continuously. Only one will be in active service, however. The second will remain silent until something happens to cause the first to fail. The connections then will be transferred automatically and at the same time an alarm signal will sound as a warning that attention is needed.

The construction of the clock necessitated much careful experimental work by the engineers of the Post Office Research Station at Dollis Hill, and it is interesting to learn that Meccano parts were used in making many of the mechanical parts of the first experimental model. A framework of Plates and Strips with many Gear Wheels and other parts were prominent features of a counting mechanism that proved invaluable in determining many of the necessary points of detail. A card dial was mounted on the front of the Meccano framework, and spindles that projected through this carried pointers that recorded the desired information. This is not the first time that Meccano has been used at the Post Office Research Station, where it often proves of great assistance in experimental work.

The making of the glass sound-track records was another interesting part of the work. With typewritten sheets in front of her, Miss Cain spoke the phrases to a microphone, and from this the sound tracks were obtained. The discs revolve at different speeds, and the concentric rings of the sound track vary in length with their distance from the centre of the disc. This part of the work therefore had to be very carefully arranged for, more especially as the final phrase heard by the telephone subscriber is made up of the currents obtained from the sound-tracks of three different records carefully fitted together. To enable this to be done, the words and phrases chosen had to be carefully designed and spaced.

In addition to the London speaking clock, similar equipments are to be installed at Bristol and Manchester, and further clocks will follow at other centres as soon as the public demand justifies them. The American telephone service has a similar time distribution system, but employs manual operators who speak the time into microphones every 15 sec.

We are indebted to the Post Office Engineering Department, and the Research Station at Dollis Hill, London, N.W., for the information in this article.

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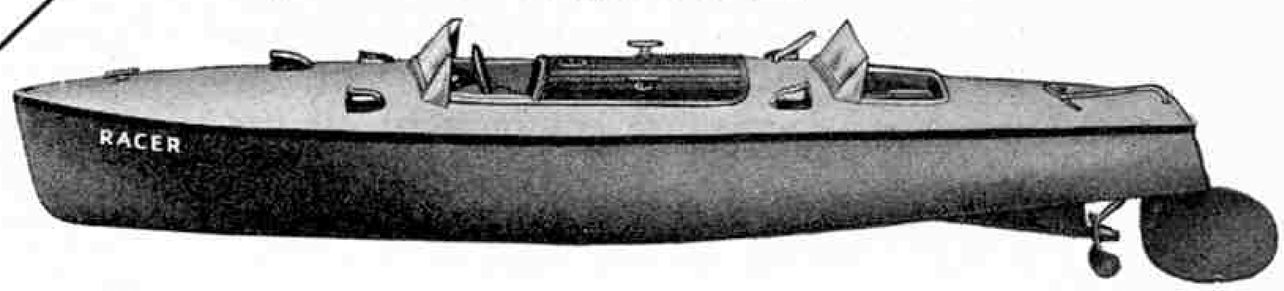

HORNBY RACING BOAT No. 3. "RACER III." Price **14/6**
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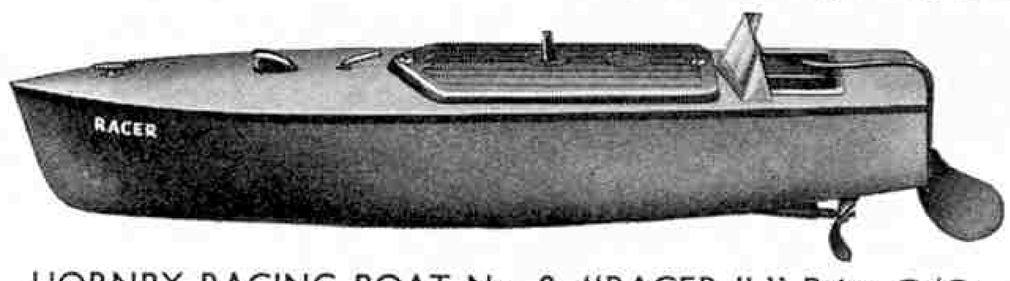

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HORNBY RACING BOAT No. 1. "RACER I." Price **4/6**
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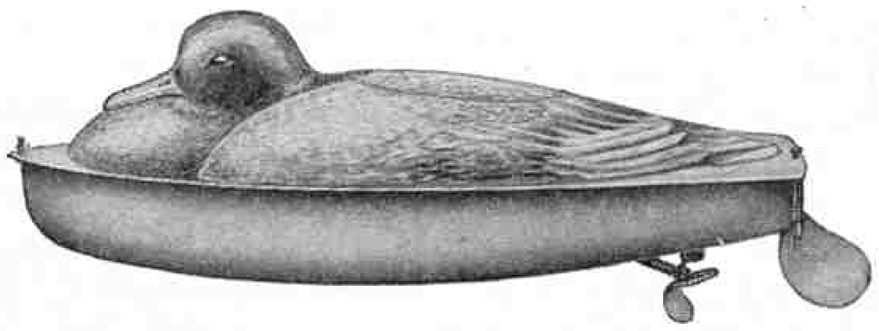

HORNBY WATER TOY (DUCK). Price **2/6**
Travels over 100 ft. on one winding. Finished in appropriate colours. Dimensions: Length 9¼ in. Beam 3 in.

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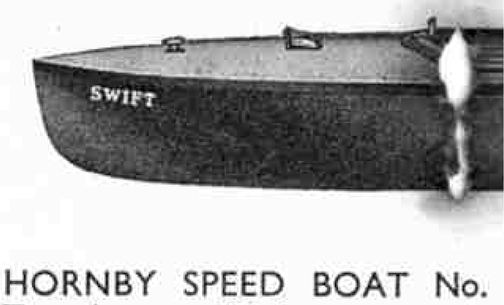

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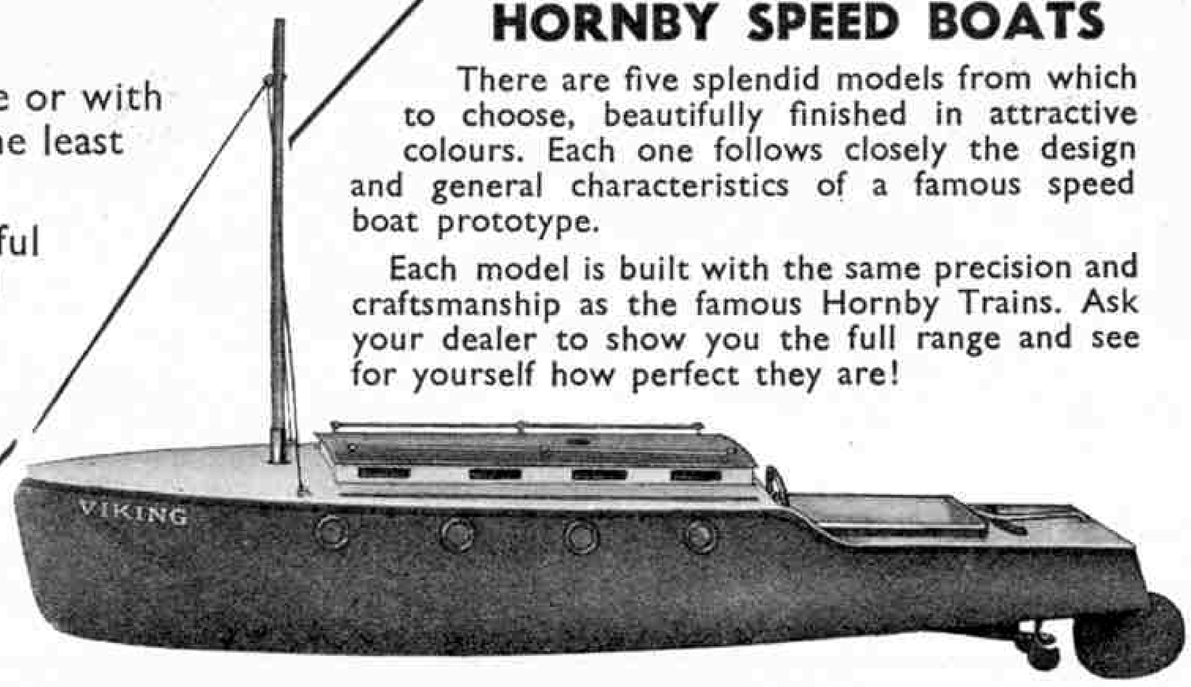

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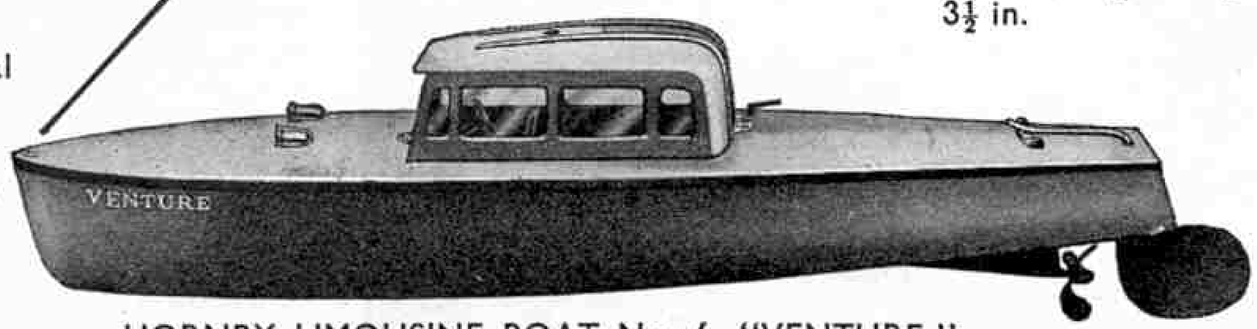

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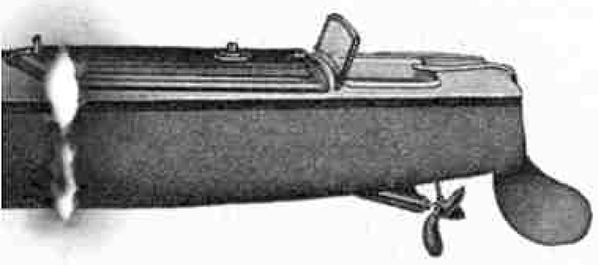

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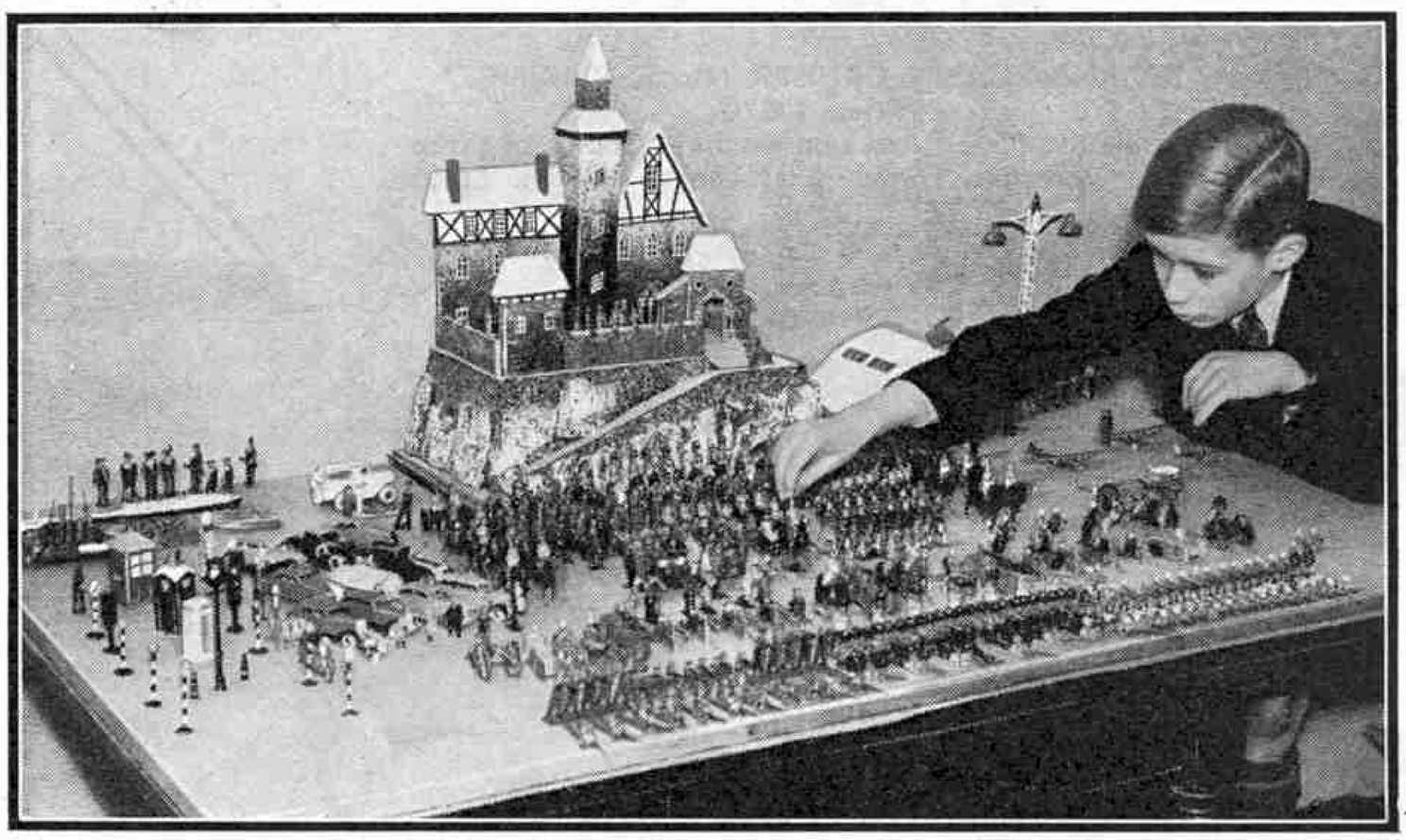
ROAD . . . LIVERPOOL 13

A Recording Studio on Wheels

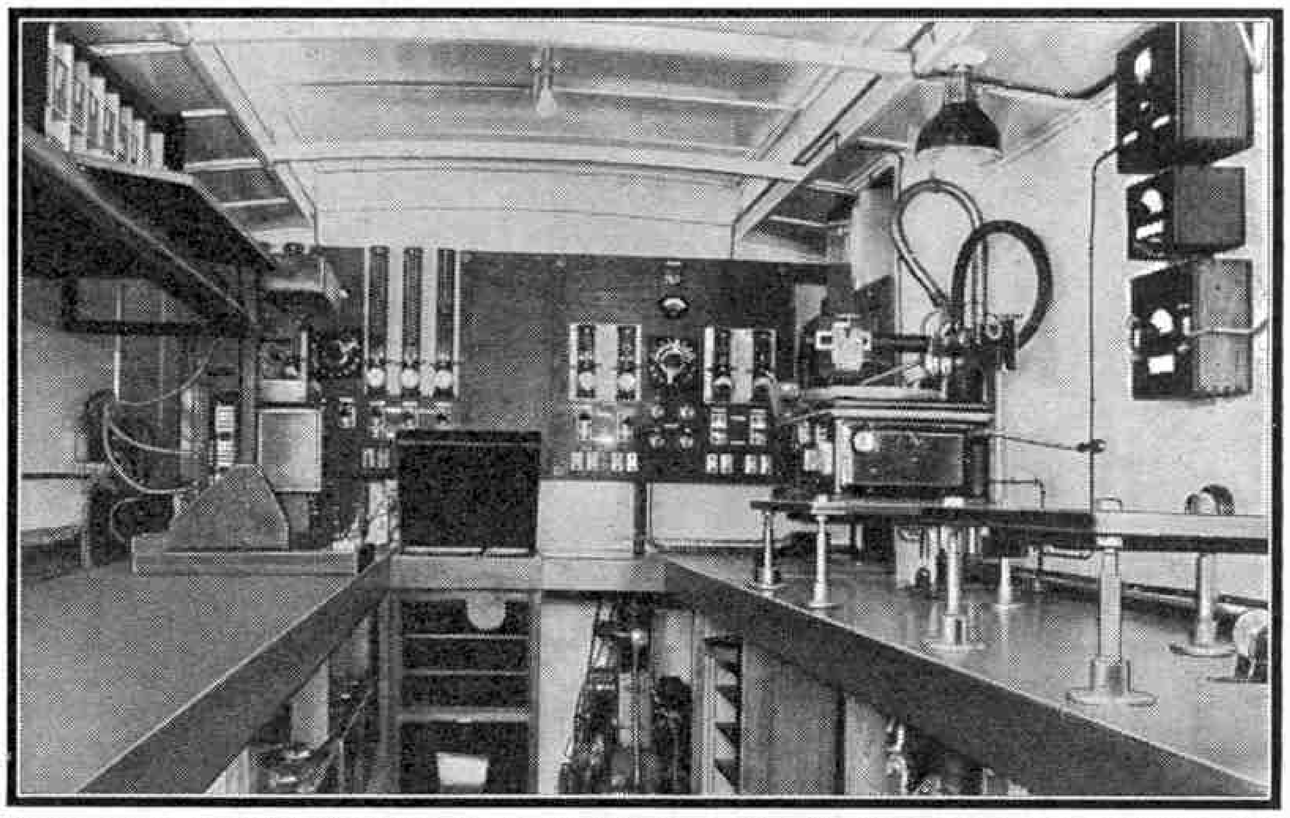
The lower photograph on this page shows the interior of the wonderful recording van by means of which "His Master's Voice" gramophone records are made of events that cannot take place in the usual recording studio. In outward appearance the van is of the ordinary type, but it is full of expensive apparatus and devices to enable complete sound records of any kind to be made, and taking it to any place where sound records are to be made is equivalent to bringing the studio itself to the performers. It is often as many as 10 days away from its headquarters in London, and it is the duty of a special staff to see that it is at all times ready to go to any place where records are to be made.

The recording apparatus is in duplicate, and each machine is fitted with a sapphire engraving needle for engraving the wavy line on the wax recording blank. Signal lights and buzzers are used to tell the engineers in charge when the apparatus has been adjusted and all is in readiness. This is necessary because for outside recording great lengths of armoured cable often have to be used to link the microphones picking up the sounds with the apparatus in the van. For instance, at such an event as the Aldershot Tattoo more than five miles of cables may be required. At times the cables cannot be taken direct to the van. It often happens that they have to be buried beneath a grandstand or under a football pitch, or carried over the tops of buildings, and on one occasion they had to be specially weighted and sunk in a river over which the van could not be taken.

Every square inch of space in the van is used for batteries, battery chargers and other equipment, including a special cabinet for the wax blanks on which the records are made. These blanks have to be kept at a constant temperature and as soon as the van reaches its destination heating apparatus is brought into use to make sure that they remain in perfect condition. The van also is securely jacked up while recording is in progress in order to keep it perfectly steady, for the slightest movement would ruin the blank in use.



A wonderful collection of more than 500 models collected by R. Lerry, Birmingham. Dinky Toys Motor Cars, a Telephone Kiosk, an A.A. Hut, Crossing Signs and other miniatures in this series can be recognised. Photograph by courtesy of the "Birmingham Post."



The interior of the "His Master's Voice" mobile recording van. This photograph, and the lower one on the opposite page, are reproduced by courtesy of the Gramophone Company Ltd.

Strong Rooms that Defy Attack

Strong rooms and safes can now be made that will defy the efforts of an entire gang of safe-breakers armed with the most powerful tools yet introduced. The secret of their construction lies in the use of an alloy, known as "Tannsteel," that has been developed by John Tann Ltd., who for years have specialised in work of this kind. This wonderful metal is capable of withstanding attack by an electric drill, an oxy-acetylene blow pipe and even high explosives.

Great ingenuity is devoted to making great safes burglar-proof in every way. Their massive doors are fitted with combination locks capable of millions of variations, and also with several key locks so that they can only be opened by the concerted action of three or more men, each of whom is in possession of a separate key. Clocks prevent the doors from being opened except at specified times, but perhaps the most remarkable feature is a device known as an insurrection lock. This can be brought into use in the event of violent riots and disturbances, and prevents a strong room from being opened even if the keys have been extorted by force from their holders and the secrets of the combination locks have been discovered.

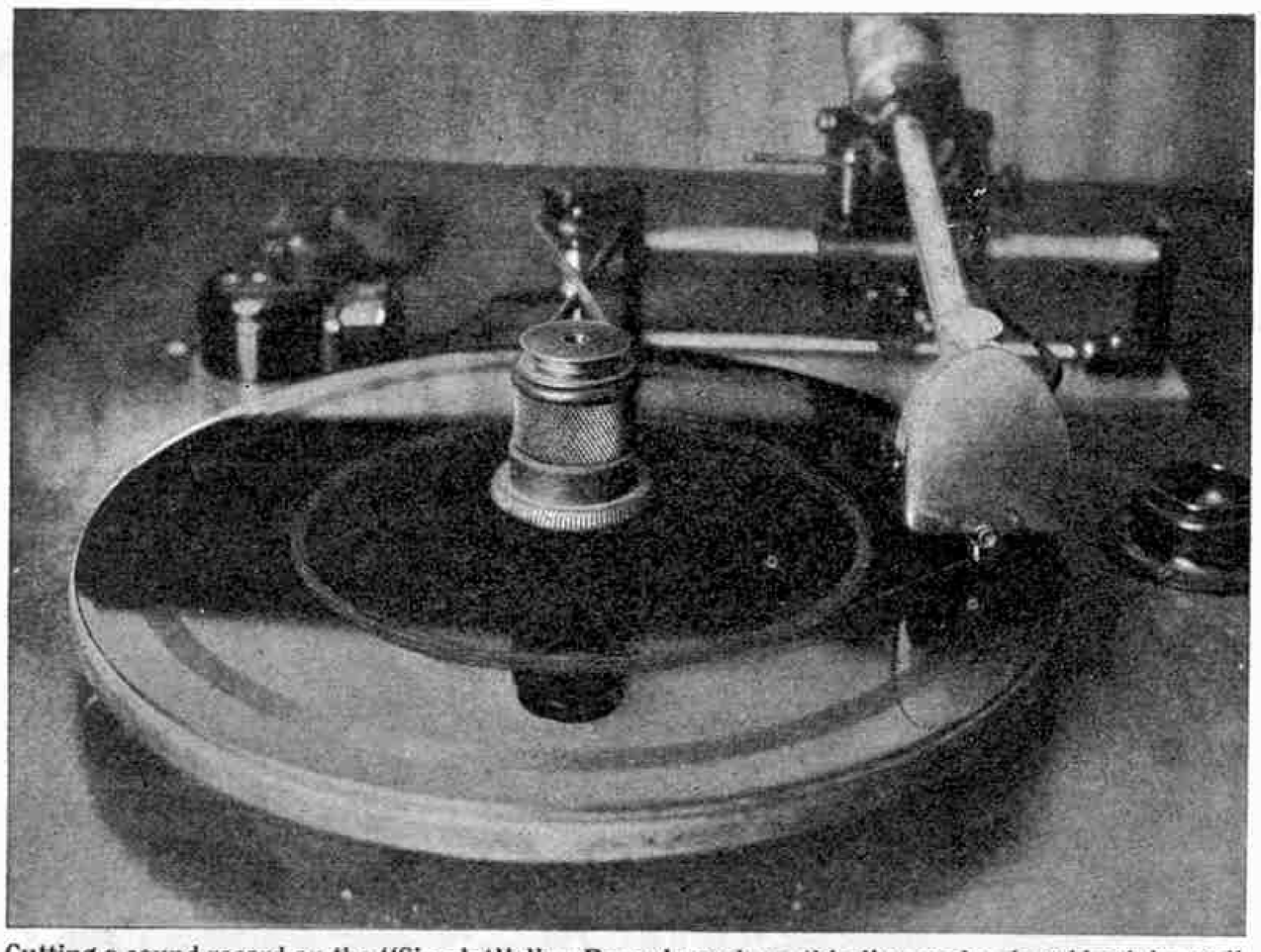
The doors of a modern strong room or vault often are of enormous size. One made recently for a foreign bank weighed 30 tons and was controlled by a time lock with four clocks, two combination locks, two key locks and an insurrection lock. Another was made of Tannsteel about 9 in. in thickness and its two combination locks provided one hundred million variations. Special bolting devices make violence of little use against doors of this kind.

Bottled Gas

Those who live in houses to which gas or electric mains have not yet been extended can now enjoy all the advantages of a regular gas service by purchasing their requirements in bottles. The gas used is not ordinary coal gas, but one known as butane that is specially suitable for bottling, for it becomes a liquid when it is subjected to a pressure of only 23 lb. per sq. in. at a temperature of 60 deg. F. It is colourless and non-poisonous, and is very heavy, so that in the event of an escape it simply remains in a layer on the floor. Leakages are readily detected, although the gas has no smell, because for commercial purposes it is mixed with another gas with an odour that gives warning of its presence.

The bottles used in this interesting new scheme are made of pressed steel without a weld, and are capable of withstanding a pressure of 700 lb. per sq. in. Thus there is an ample margin of safety, for the normal working pressure is only about 23 lb. per sq. in. A loaded bottle is only 16 in. high and weighs about 50 lb., and can readily be connected to gas cookers or gas fires by means of flexible reinforced tubing. A special valve is fitted to reduce the pressure of the gas.

The advantages of the scheme have already been appreciated so highly that many installations have been made in country districts, and several villages are considering the use of the gas for street lighting purposes.



Cutting a sound record on the "Simplat" disc. Records made on this disc can be played back immediately. Photograph by courtesy of the V.G. Manufacturing Co. Ltd.

A Gramophone Record Invention

A record made on the usual wax blank cannot be played over without destroying it, but a new recording material for sound tracks has been invented that is claimed to be free from this drawback. It is said that speech, music and other sounds can be played back 15 to 20 times from the discs on which they have been recorded, and that these can be used for at least 200 reproductions if the material is hardened and polished by means of special fluids.

The "Simplat" disc, as this invention is called, is made of glass and is coated with a special composition in which the sound grooves are cut. No elaborate equipment is required for making a record, all that is necessary being a microphone, a wireless set or amplifier, and a turntable with a pick-up, together with a tracking device to guide the cutter in the narrowing circles it makes round the disc. A special sapphire that will cut 24 double-sided records is recommended, but a steel cutting needle also can be used. The records made on the new discs can be played on any gramophone, and the discs themselves are not affected by climatic conditions. The glass always remains flat and this is of great importance in preventing irregular cutting and giving good reproduction.

An expert examining a wax blank ready to have a sound track recorded on it in the "His Master's Voice" mobile recording van.

Building with Two Million Inhabitants

An interesting effort has been made in Australia to find how many termites, or white ants, as they are often wrongly called, make their home in an ant heap. The results are astonishing, for they reveal that from 750,000 to nearly 2,000,000 of the species of termites dealt with may inhabit a single mound, although the largest mound in which a census was taken was only 19 in. in height and about 3 ft. 4 in. in diameter. In view of their size and number, it is unnecessary to say that no effort was made to count the individual termites. Instead the mounds were dug up and their population found by a weighing method, allowance being made for absentees. It is interesting to find that the termites show a tendency to stay at home during the cooler months of the year, when the population of any mound is at its greatest.

A Robot Ear

A mechanical ear that listens only to the sounds that the human ear can take in has been constructed at the National Physical Laboratory. It looks like a portable wireless set and measures sounds by comparing them with a note of fixed pitch that is similar to the signal used for tuning purposes by the B.B.C.

This artificial ear has been designed to measure some of the noises that disturb us in our daily lives. One of the disadvantages of living in an age of machinery is that we are frequently assailed by such sounds as the clatter of pneumatic drills and the roar of engines. Some of these no doubt can be made less penetrating and annoying, and the robot ear will help to decide what can be done in this respect by measuring them accurately. We cannot hope to escape noises of this kind completely, but any scheme for limiting them would be welcomed.

I have been greatly interested to learn that measurements have been made in the National Physical Laboratory, of the minute crystals that build up a piece of steel. These crystals are far too small to be measured by any ordinary means, and it has been necessary to adopt complicated methods involving the use of X-rays to find how large, or rather, how small they are. They are so tiny that there may be from one million to 100 million of them in a cubic inch of steel, but in spite of their very small dimensions they break up when the metal is subjected to severe stresses. The fragments then produced appear to be of uniform size and it would take about one hundred thousand of them to make a strip an inch in length.

The larger crystals are entirely shattered into these fragments when the steel is more heavily stressed, and it is then that cracks begin to appear. These are the first outward signs of failure, and thus the breakdown through wear of a steel part in an engine or machine may be due literally to the shattering of the crystals of which it is built up.

A Scientific Detective at Work

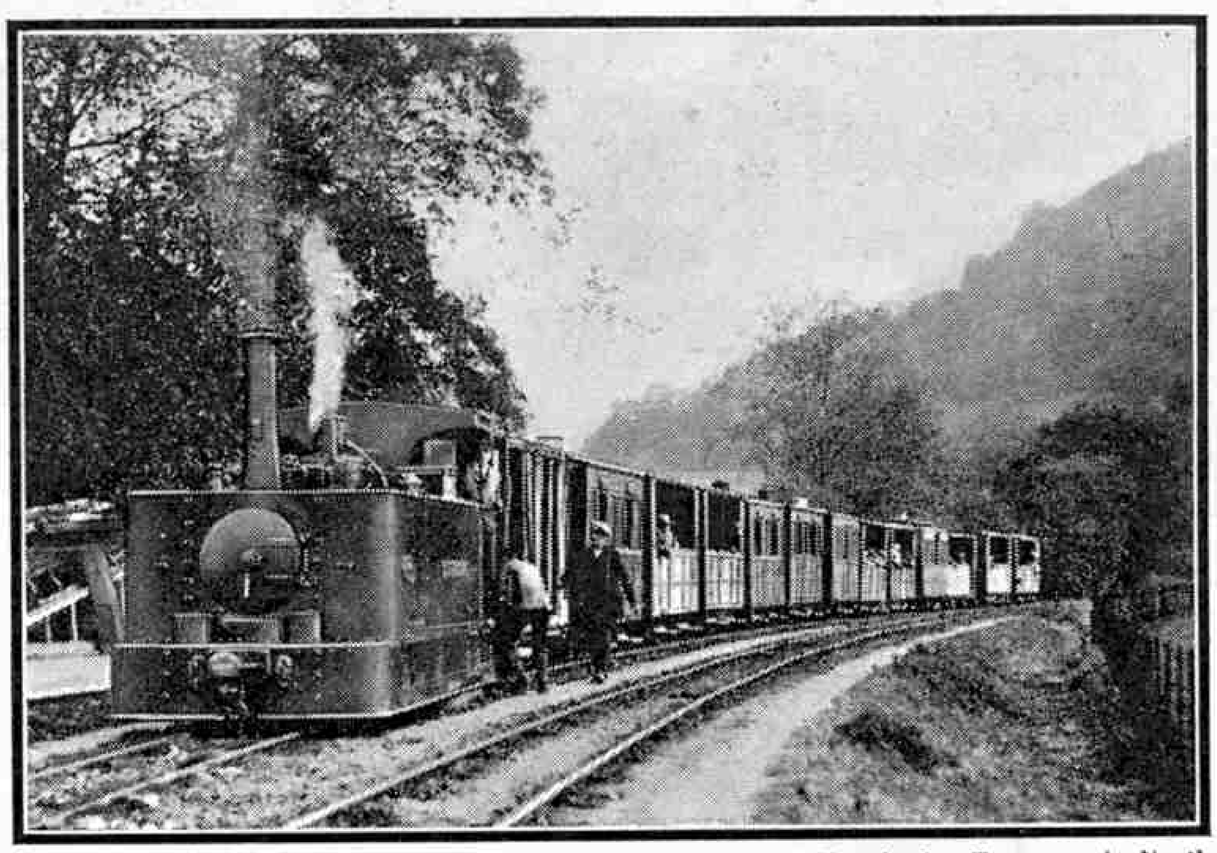
I wonder how many of my readers realise how much care is taken in testing the working parts of engines and machinery of all kinds. This of course is specially important with aero engines, upon the performance of which the lives of aeroplane passengers and pilots may depend. An engine of this type is dismantled after it has been in operation for its allotted period, and is then carefully examined. In the case of Imperial Airways a complete overhaul is made after an engine has been in service for about 600 hours, and every part is then cleaned and thoroughly inspected. The first indication that any part is in need of replacement may take the form of a small surface crack. Fortunately such a flaw can be detected long before it can be seen with the naked eye by magnetising it and pouring over it a liquid, known as "detecting ink," containing a metallic powder that reveals the tiniest of flaws as thin black lines.

Steam Tramway Systems

A Once-Popular Form of Local Transport

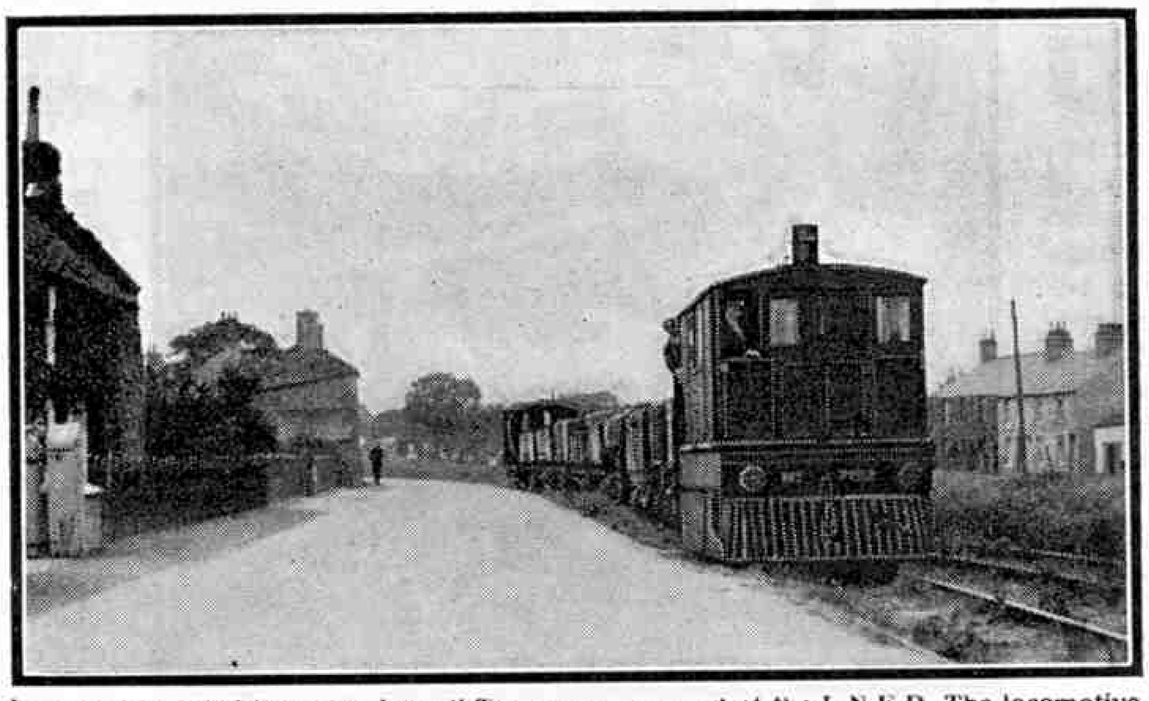
By H. C. Casserley

IN this country the steam-operated tramway is almost extinct nowadays, although it is still met with in various parts of the Continent, in particular the rural districts of Belgium and Holland. It should not be forgotten, however, that during the later years of the past century steam power played a considerable part in the development of local passenger transport until it was superseded by electricity. At a comparatively early date the electric tramcar was found to be especially suitable for this sphere of activity, but in its turn it is now gradually giving way to the more mobile motor omnibus propelled by the internal combustion engine.



A passenger train as formerly operated on the narrow-gauge Glyn Valley Tramway in North Wales. The curious appearance of the locomotive is due to the prolongation of the side tanks and the presence of the casing round the wheels.

Steam-operated tramways may be said to have reached their hey-day during the eighties and earlier nineties of last century and at that time there were many such undertakings, operating both on the outskirts of London and in the provinces, particularly in the Midlands. Most of these have long since disappeared and are now only remembered by older members of the past generation. Some survived in a few out-of-the-way rural areas until comparatively recently, and even to-day one or two are still run for goods traffic only. One of these is the Wisbech and Upwell Tramway, formerly operated by the Great Eastern Railway, and now a part of the L.N.E.R. system. Running from Wisbech, in Cambridgeshire, this line follows a course along one side of the road for practically the whole distance of about eight miles to the villages of Outwell and Upwell. Goods trains only are run now and during the season a large volume of fruit and flower traffic is conveyed over its standard gauge track.



A scene on the Wisbech and Upwell Tramway, now part of the L.N.E.R. The locomotive is of the "boxed-in" tramway type, as described in this article.

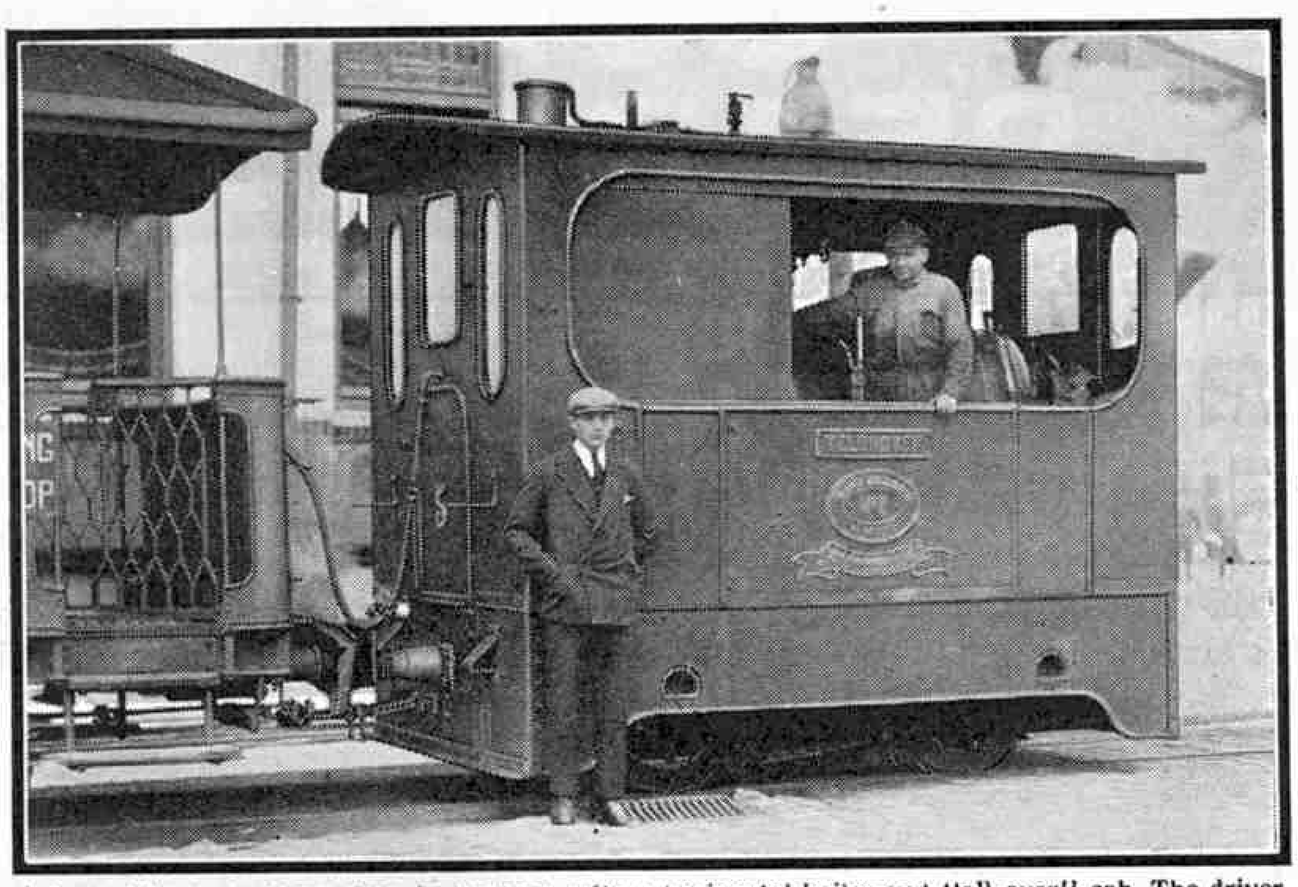
The type of locomotive usually employed on steam tramways was of the 2–2–0 or 0–4–0 type, and was generally totally enclosed with iron sheeting in the form of an all-over cab, the top of the chimney projecting through the roof. The boiler was of the orthodox pattern common to larger steam locomotives, but in some designs a vertical boiler was used. The regulator and other controls were at one side of the boiler instead of at the rear of the fire-box, and this was the position occupied by the driver. The fireman took up his post on the opposite side, on which was to be found the fire-hole door and a small bunker containing the necessary coal. The wheels were enclosed with iron sheeting, this being necessary owing to the presence of straying animals on the public highway. Suitable holes or hinged flaps were provided where necessary to give access to the motion and working parts for oiling and inspection.

The upper illustration on the opposite page shows a Dutch tramway locomotive that may be taken as a typical example of the general arrangement, and is very similar to many tramway engines that were to be found in England 40 or 50 years ago. In spite of their diminutive proportions, these little engines were capable of drawing anything up to six or seven fully-loaded cars, often on gradients that were necessarily severe owing to the fact that the line generally followed the undulating contour of the highway. In some cases the whole or part of the track was constructed over the company's private property, and was fenced in as on a main line railway.

Passenger coaches were generally of the usual single- or double-decker tramway type, with longitudinal seats on the lower floor and "garden" seats on the upper storey, if there was one. The upper open-air passengers enjoyed the benefit—or otherwise—of the smoky exhaust from the locomotive!

One of the last passenger steam tramways operated in the neighbouring counties of London was the Wantage Steam Tramway, which was opened in 1875 to provide communication between the charming old country town of Wantage in Berkshire with Wantage Road station on the Great Western Railway's Swindon line. This station was about three miles distant, and the nearest point of main line communication that the town has ever enjoyed. Passenger trips making connection with the G.W.R. trains were operated as recently as 1925,

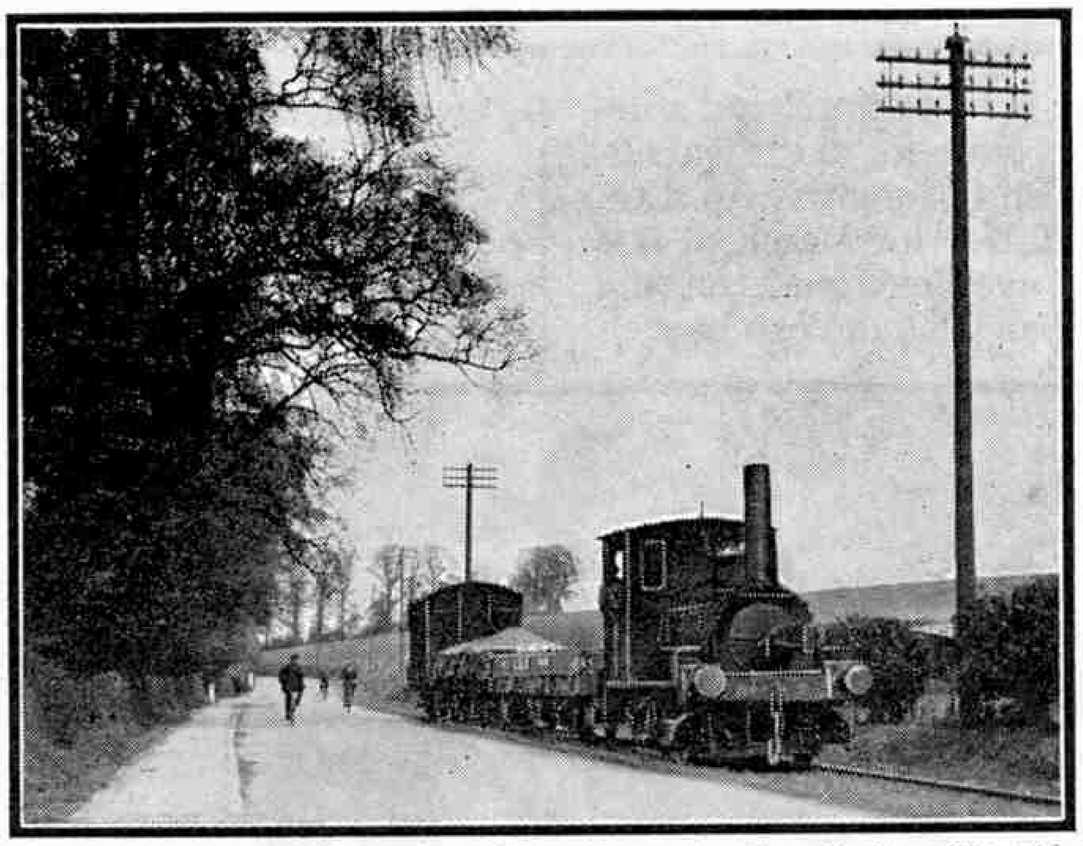
when they were withdrawn and a service of omnibuses substituted. The engine generally in use was of the usual four-wheeled enclosed tramway type already described. Goods traffic is still carried, however, by two 0–4–0T locomotives of orthodox if somewhat ancient design. The one shown in the lower illustration on this page was in fact constructed as long ago as 1857 by Messrs. George England and Co., of Hatcham Ironworks, a London locomotive-building concern that long ago ceased to exist. This interesting little engine is probably one of the oldest steam locomotives still in regular commission in this country.



A typical tramway locomotive in Holland, with a horizontal boiler and "all-over" cab. The driver rides on one side of the boiler and the fireman on the other.

The Swansea and Mumbles Railway is a good example of a former steam tramway that has been converted to electric traction, and it still carries a heavy traffic. The line is 5½ miles in length and connects the industrial part of Swansea with the watering place of Mumbles on the Bristol Channel. It runs on its own private property and station platforms are provided, but at the same time it is a true tramway in that the old steam-hauled coaches were of the usual double-decked tramcar type; and the new electric cars are large bogie vehicles seating 106 passengers, 48 in the lower saloon and 58 on the upper covered deck. The conversion of the line to electric traction took place as recently as 1929.

The small and little-known Rye and Camber Tramway, formerly worked by diminutive steam locomotives of 2–4–0 tank design but now operated by a small petrol tractor, is situated on the Sussex coast. This little line of 3′ 0″ gauge runs from the outskirts of Rye, formerly a seaport, but now owing to the recession of the sea an isolated township situated in the Romney Marshes. The line runs over the flat sandy wastes to give access to the well-known Camber Sands. It is essentially a one-man concern, for the driver is not satisfied with his own duties, but also carries out those of a guard, conductor and stationmaster all combined!



A goods train on the Wantage Steam Tramway running alongside the public road. The locomotive is an ancient 0-4-0 tank built in 1857.

Many visitors to North Wales will have enjoyed a trip on the little Glyn Valley Tramway, which runs from Chirk up the pretty valley of the Ceiriog river to Glynceiriog. Like most other such tramways, the line ran for the most part along the side of the road, but diverged in one or two places and had a station and yard of its own at each terminus. Its three tramway-type engines differed slightly from the usual design in that the upper part was not boxed in and the driver's cab was at one end, as on an ordinary locomotive. A fourth engine was a 4–6–0 tank built by the Baldwin Locomotive Works, U.S.A., for service in France during the War, and was purchased from the Government at its conclusion. The passenger coaches were small vehicles of compartment design, many of them without side windows and some without roofs! The gauge of this line was only 2′ 4½″ instead of the more common standard gauge of 4′ 8½″. Passenger working ceased in 1933.

Turning now to Ireland, we may take a brief glance at the Giant's Causeway, Portrush and Bush Valley Tramway. This gives a connection between the popular watering place of Portrush and the wonderful Giant's Causeway on the north coast of Antrim. The perfect hexagonal formation of the rocks forming the Causeway is an extraordinary freak of nature. The tramway was built in 1880-1881. From the first it was intended to work this electrically, and it was in fact the first hydro-electric line in these islands; but for various reasons steam locomotives of the tramway type were used on it in its earliest days. Near by a second steam tramway connected Portrush and Portstewart. This was closed in 1926.

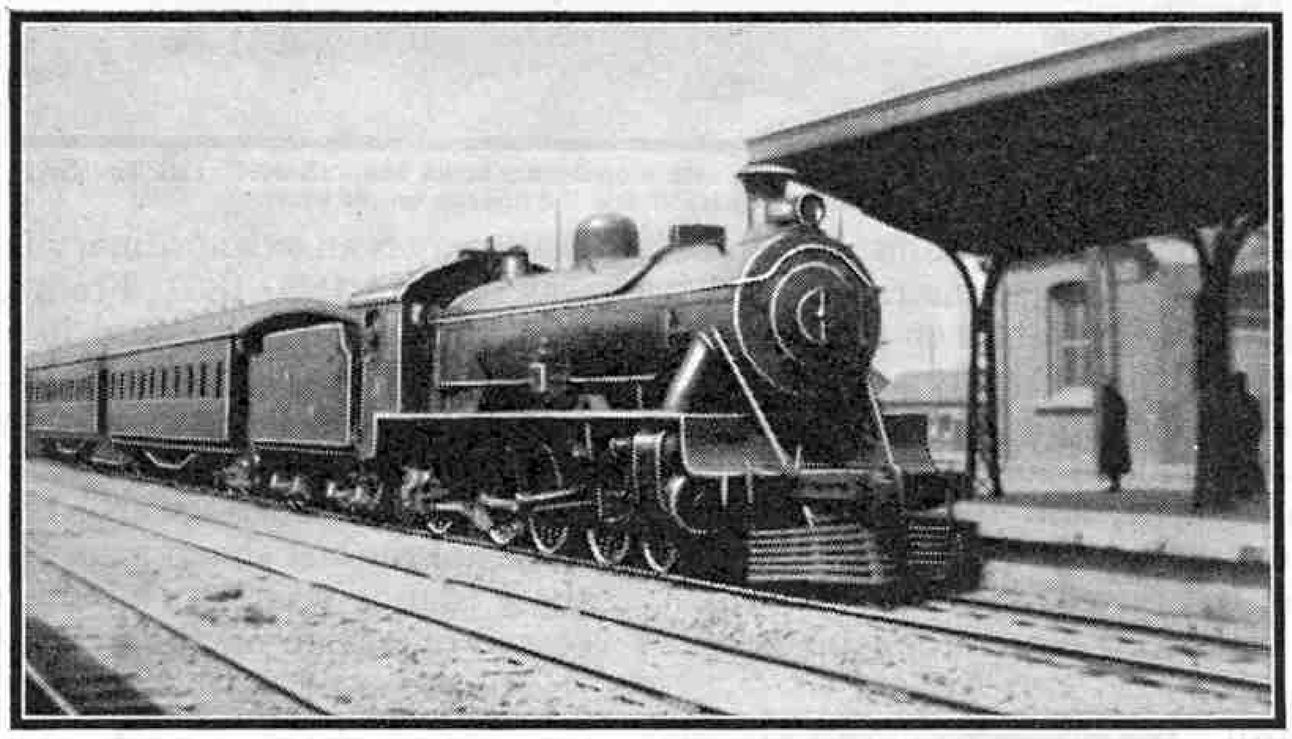
One of the last steam tramways to work for passengers in these islands was the Dublin and Blessington line, which ceased operation on the 31st December, 1932. During the later part of its existence there were three steam locomotives. One was of the ordinary four-wheeled box type and was not often used; the other two were powerful 2–4–2 engines of a unique "double-ended" design. Instead of having the usual arrangement, whereby the driver took his place on one side of the boiler, these locomotives were provided with two cabs and a duplicate set of controls so that the engine could be driven from either end. The cars in use were large bogie double-decked vehicles, and frequently the trains at weekends consisted of five or six carriages, Blessington being a popular resort for picnickers from Dublin. Curves were numerous and severe, and riding on the upper deck of one of the cars of these trains was a most enlivening experience, speeds of 30 m.p.h. often being attained. Traffic at other times was very light however, and various forms of petrol and oil-operated rail cars were tried with a view to economy, but eventually the line had to close down owing to omnibus competition.

The steam tram engine has played its part and its passing will be regretted by few, since its work can now be more successfully carried out by other forms of transport.

These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Railway Notes from Tientsin

The most important railway developments in China have taken place in the north, with Peiping and Tientsin as the centres. These cities are connected by a railway that is continued to the Manchurian border at Shanhaikwan, near the Great Wall, where connections are made for Moukden. Tientsin has two stations on this railway. These are called Tientsin East and Tientsin Central, and each has four covered platforms. Modern colour aspect signals are in use there.



An express train, headed by a "Pacific," at Tientsin East station. Photograph by D. Hall, Tientsin.

The locomotives are about 16 years old on the average, but are well kept and some are fitted with smoke deflectors. More than half of them are "Pacifics," and a description of engines of this type built for the Tientsin-Pukar railway by the North British Locomotive Co. Ltd. at Glasgow was given in the "*M.M.*" for March of last year. These engines are doing excellent work on the expresses between Peiping and Shanghai, and can be seen regularly at the railway depot at Tientsin. All passenger trains are hauled by "Pacifics," but the locomotives have no definite class of work to do and these engines also can be seen at the head of goods trains. In addition there are several "Mikado" freight engines, some ancient tank engines that pull local trains and are used for shunting, and old 4–4–0s, dating from about 1910, that have stove pipe chimneys and large driving wheels.

Box cars somewhat similar to those of North American Railways are used; otherwise the rolling stock of goods trains is similar to that seen in Great Britain. The passenger services are very good. There are three classes. The first class coaches have red bands round them, and white and blue bands distinguish the second and third class coaches respectively. Coolies constitute more than 90 per cent. of the total number of passengers and they travel in the third class coaches.

Passenger trains generally consist of about 12 coaches with a total tare weight of about 420 tons. Speeds of 65 m.p.h. are attained with these loads and the fastest train service is that between Peiping and Tientsin, a distance of 86.5 miles that is covered non-stop in 110 min. at an average speed of 52.5 m.p.h. Automatic tablet exchange apparatus is now in use for single line running and this has speeded up traffic considerably.

Coal trains are made up of loads of more than 900 tons. High speeds of course are impossible with these heavy trains of mineral wagons.

D. Hall (Tientsin).

Ice Cutting in Newfoundland

The practice of cutting ice from lakes in winter and storing it for use in summer suffered a severe blow when mechanical refrigeration became common. It is still carried on in many places, however, including Carbonear, Newfoundland, where I live. There the ice is obtained from a large pond and most of it is cut under the direction of one man, who has been in the business for nearly 50 years.

Sawing natural ice into blocks to be stored for use in summer. Photograph by M. Maddock, Carbonear, Newfoundland.

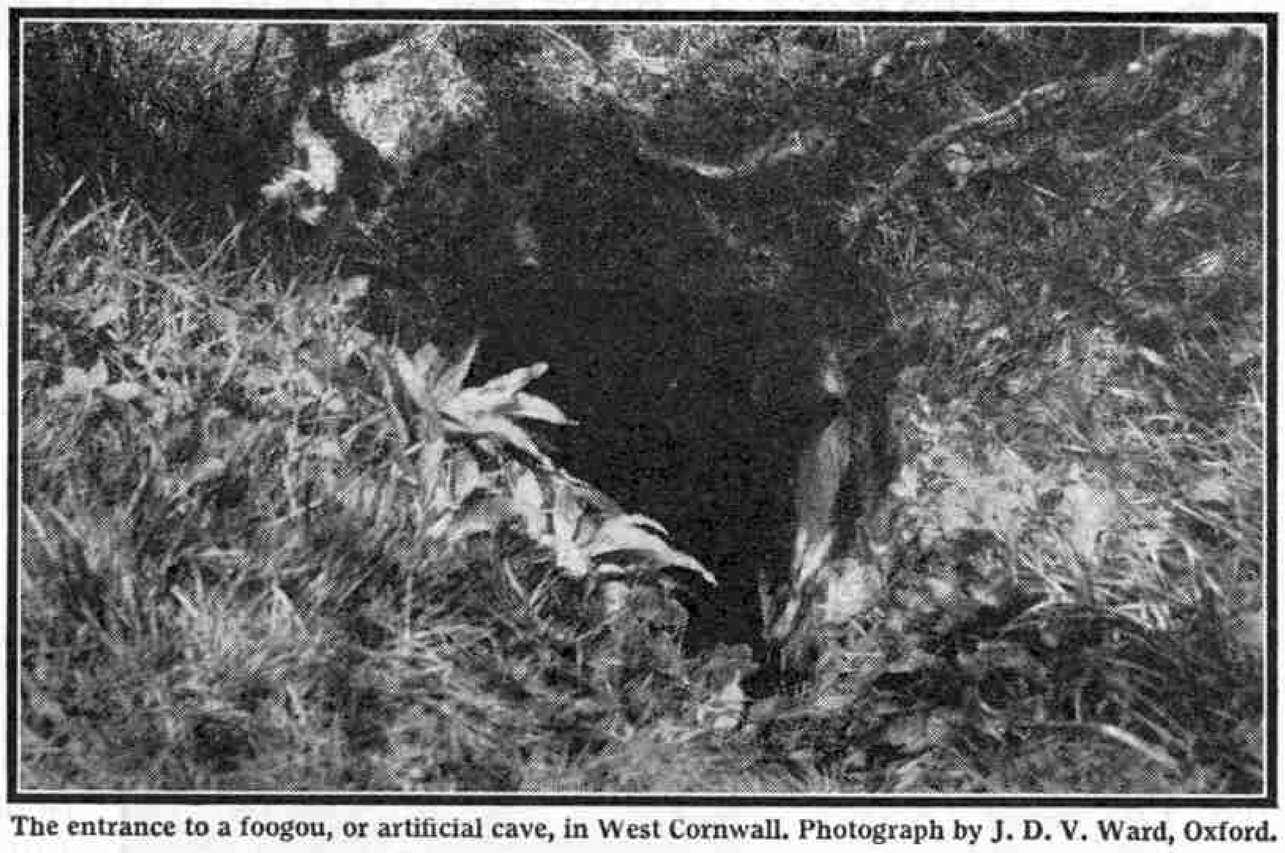
There are three stages in cutting out ice. The first cut is a straight one that serves as a guide line. Men armed with long steel saws then begin to work, cutting at right angles to the marked line at intervals of about 15 in. Finally blocks measuring about 15 in. each way are detached by striking the uncut sides with crow-bars.

The blocks are loaded on sledges and are conveyed to the ice house, where they are packed in sawdust to remain until they are needed for various purposes in the summer.

M. Maddock (Carbonear).

The Foogous of Cornwall

The foogous of West Cornwall are artificial inland caves, and some of them are of considerable size. One near Bartinney indeed is capacious enough to shelter a fairly large herd of cattle. It has been suggested that the foogous were constructed for the storage of food, and another theory is that they were intended as hiding places. It seems fairly certain that use has been made of them by smugglers, and no doubt wreckers also concealed their plunder in them.



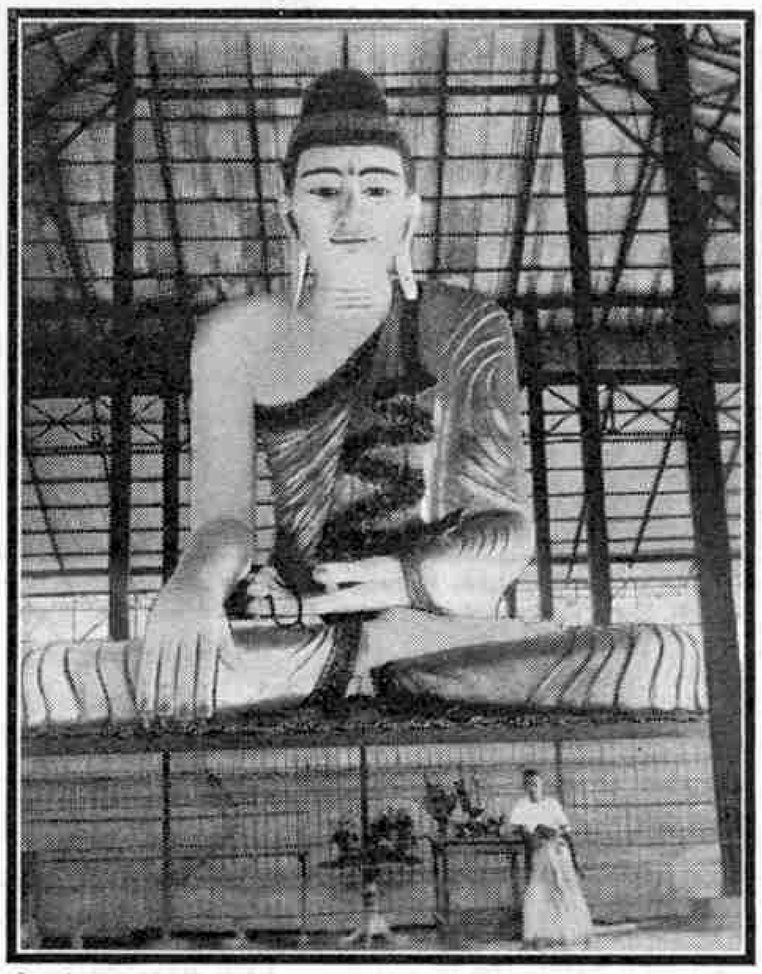
The entrance to a foogou, or artificial cave, in West Cornwall. Photograph by J. D. V. Ward, Oxford.

As a rule there are two or three entrances to a foogou and these are usually fairly well concealed, although there does not appear to have been any definite attempt to ensure secrecy. Inside is a stone walled passage of varying length, with one or possibly two chambers cut out at the side. Ancient wheels, chapels, stone circles or hut remains often are to be found in the vicinity of these ancient structures. It is doubtful if the one illustrated on this page is really antique, however, for no relics of a former age have been found immediately at hand. It stands in what is now a private garden and is about 1¼ miles from the nearest cove. J. D. U. WARD (Oxford).

Images of Buddha in Burma

Burma is known as the land of pagodas, and one of these, the famous Shway Dagone, in Rangoon, is one of the wonders of the world. The country is remarkable also for its many images of Buddha, and the people reverence them as much as their pagodas.

The lower photograph on this page shows the image of Buddha at Thongwa, which is about 20 miles east of Rangoon, and gives a good idea of the general appearance of these images. It is of immense size, as comparison with the figure of the man leaning on the table in front of it indicates, and is housed in a huge steel-framed structure covered with sheets of corrugated iron. The robes and headgear of such an image usually are gilded.



A giant Burmese image of Buddha. Photograph by T. Sike Shu, Thongwa.

There are many images of Buddha in other European countries, such as Siam, China and Japan, but these differ in many respects from those of Burma, which are unique. T. SIKE SHU (Thongwa, Burma).

Rambles in Sicily

During the Easter holidays last year I and 80 other members of the School Scout Troop spent an interesting holiday in Sicily. We arrived at Palermo, Sicily, early one morning and there motor coaches, sent by the Mayor, were waiting to take us to Mondello, which we reached in a short time. From there we drove round the bay to the Colonia Marina, which had been put at our disposal. It was built as a shipbuilding yard and barracks during the Great War and has since been used as a holiday "camp" for Italian children. We spent the remainder of the day exploring the district and in bathing.

Next day we went to Bottadefalco by motor coach, and from there walked up a mountain path. Progress was slow, as the day was very hot, but by lunch time we reached the monastery of San Martino. After a brief respite we followed a path over the hills to Monreale, where we quenched our thirst with abundant supplies of oranges, which we bought for little more than a halfpenny each. A thrilling motor coach ride back over the hills to Mondello completed our day's tour.

We set off next morning to climb Monte Peligrino, a steep height that overshadows Colonia Marina. When at last we reached the summit we saw many black snakes that darted across our path, and one member of our party narrowly escaped being bitten. From the mountain we had a magnificent view of the coast from Palermo to Mondello, and saw the Colonia Marina far below us. We had an early supper that evening, as we had been invited to go to the opera as guests of the Mayor of Palermo.

D. JENNINGS (Bristol).

A Visit to an Engine Shed

It was my good fortune recently to visit the L.N.E.R. Haymarket Engine Shed, Edinburgh. As I arrived the famous "Mikado" locomotive *"Cock o' the North"* was leaving for Waverley Station to take charge of the 9.55 a.m. Aberdeen express. For its brief run to the station it was coupled to a "Scott." This engine is a 4–4–0 of the former North British Railway. With its tender it weighs only 104 tons, against the 165 tons of its companion on this occasion, and the two locomotives were in striking contrast to each other.

Inside the sheds there were several engines awaiting repair, the most prominent being "Pacific" No. 2579, *"Dick Turpin."* The big mechanical coaling plant attracted attention and it was wonderful to see the tender of a "Pacific" filled with nine tons of coal in a few minutes. We had a splendid time inspecting other locomotives, among them "Shires" and "Directors," and were sorry when the time came for us to leave.

W. MCWHIR (Edinburgh).

The Sussex Iron Industry

Where Drake's Cannon Were Made

By W. A. Bagley

ANYONE asked to mention the chief iron districts of England probably would name among other places the Black Country, Cleveland in Yorkshire, Frodingham in Lincolnshire and Corby in the county of Northampton. These are in the North and Midlands, and many would be surprised to learn that the rich pastures and primrose-carpeted woods of Sussex were the chief iron producing district in England from the earliest times right up to the beginning of last century. The cannon in the ships of Drake and other great seamen who sent their shot crashing into the proud galleons of the Spanish Armada were cast there.

Few people realise how extensive the Sussex iron industry was. It is often referred to as the Wealden industry from the name of the district in which it was carried on, and the story of ironworking there goes back to very early times. In the British Museum there are specimens of British iron that the ancient Britons wore, not as ornaments, but as outward signs of wealth, and when the Romans came, they seized the existing holdings and exploited them for their own purposes.

In those early days the ore was dug in red clods out of shallow pits or hillsides, where its presence was betrayed by a rusty red colour. Sometimes bell pits were dug, but these were rarely more than 20 ft. deep or 6 ft. in diameter. The ore was first washed to remove dirt, and then "burnt," that is roasted or calcined. This treatment removed further impurities, and enabled it to be broken up into small pieces that were more easily smelted. Care had to be taken not to overheat the material, for this would have caused it to fuse into a mass.

The iron was smelted on what was known as the bloomery hearth. The term "bloom" is used to this day, and comes from an Anglo-saxon word *bloma* that in general terms means a lump of metal. The process is still used among primitive peoples, and in one direct operation produces a small piece of iron.

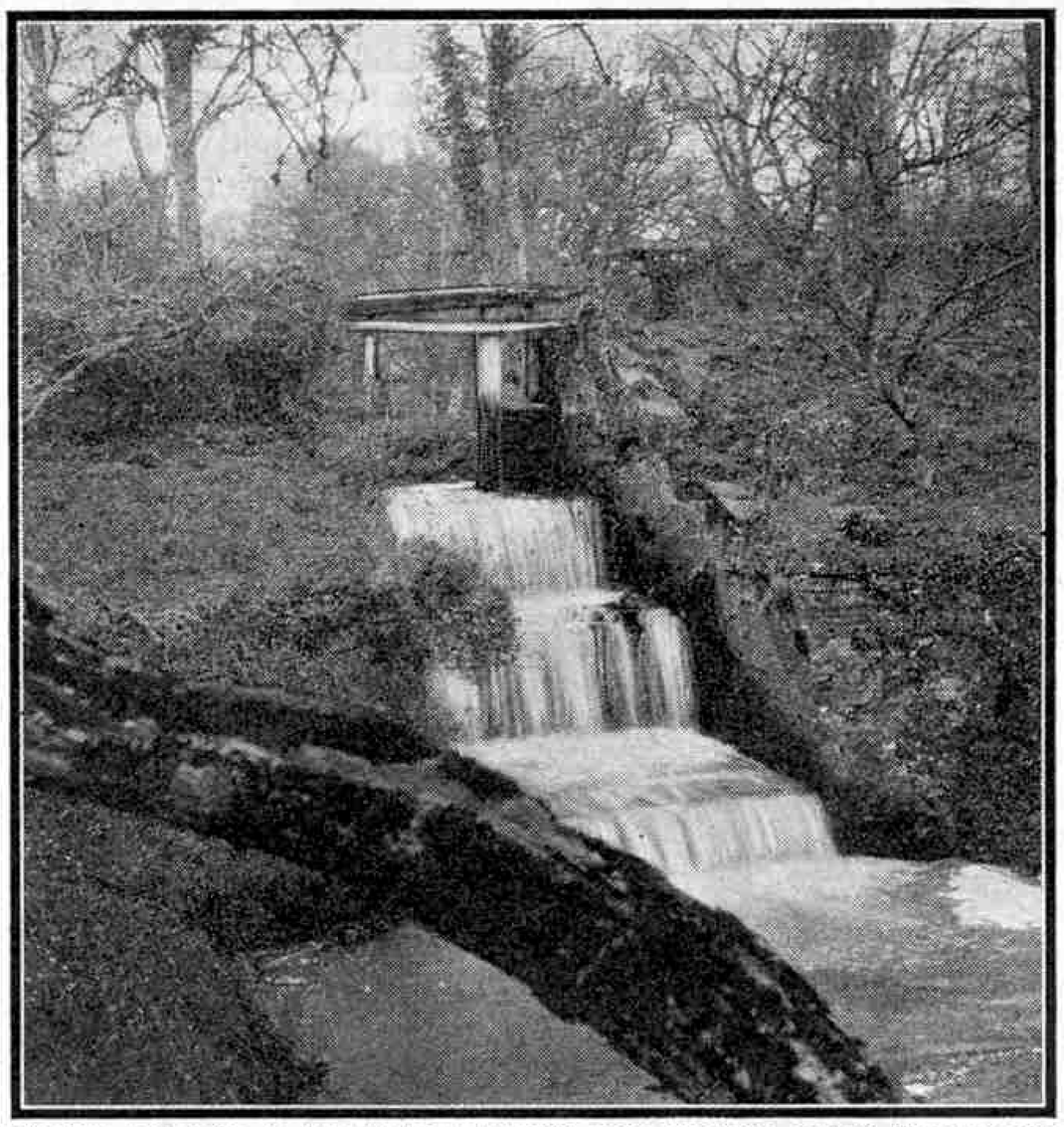
First of all a saucer-shaped depression from 7 ft. to 9 ft. in diameter was lined with blocks of rough sandstone and beaten clay. Upon this a conical heap consisting of alternate layers of iron ore and charcoal was raised, and the whole was covered with a thick coating of clay. Gravel and old slag were strewn on the ground around the heap to provide a platform for the workmen, and the nozzles of the bellows, which were made of ox-hide, were pushed into the pile near the bottom. Several pairs of bellows were used, and after the charcoal had been ignited the hearth was kept at full blast for about six hours.

The heat was not great enough to melt the iron set free, and this merely became pasty enough to trickle down to the floor of the hearth. The product was wrought iron. If by any chance the temperature became too high, the iron was converted into what we now call cast iron. This is more brittle than wrought iron, and as the people of the day did not understand how to work it, the bloom thus made was regarded as spoilt and thrown away.

After the smelting, the hearth was knocked down to obtain the iron. This was very impure, although only the richest ores were used, and was full of cinder that had to be beaten out. It was then sold to the smith, and was worked without any further treatment.

The process was a wasteful one, for the iron was never fully extracted. The cinder indeed was so rich in iron that in later times it was used instead of ore, and it also was a good source of slag that was valuable as a road-making material. The hearths were of a temporary nature, and few tools were used.

The industry declined in the Dark and Middle Ages, and survived only as a limited and almost domestic industry. During the 15th century a new process for extracting iron from its ores was introduced from the Continent, however, probably from the Liege district, in which the recently invented blast furnace was used. This is a tall structure that is fed with ore and fuel at the open top, and from which the molten iron is withdrawn at the bottom. A continuous blast of air is driven through the mass, and the iron tapped off is led into moulds. It is cast iron, containing a small proportion of carbon, and can be converted into the more malleable wrought iron by reheating.



The bay and sluice at Ashburnham Furnace, near Penhurst, Sussex. This was the last of the old Sussex iron furnaces to be kept at work.

The introduction of the blast furnace gave a tremendous impetus to the industry, which rapidly grew in importance. It reached its peak during the time of Queen Elizabeth, when it is estimated that not less than 7,000 people were employed in it. This was a very large percentage of the population of those days. The iron workers became prosperous, as the fine houses they built show, and great landowners entered the trade in order to make the most of their woodland and mineral wealth. This was the first step in changing England from an agricultural country into an industrial one.

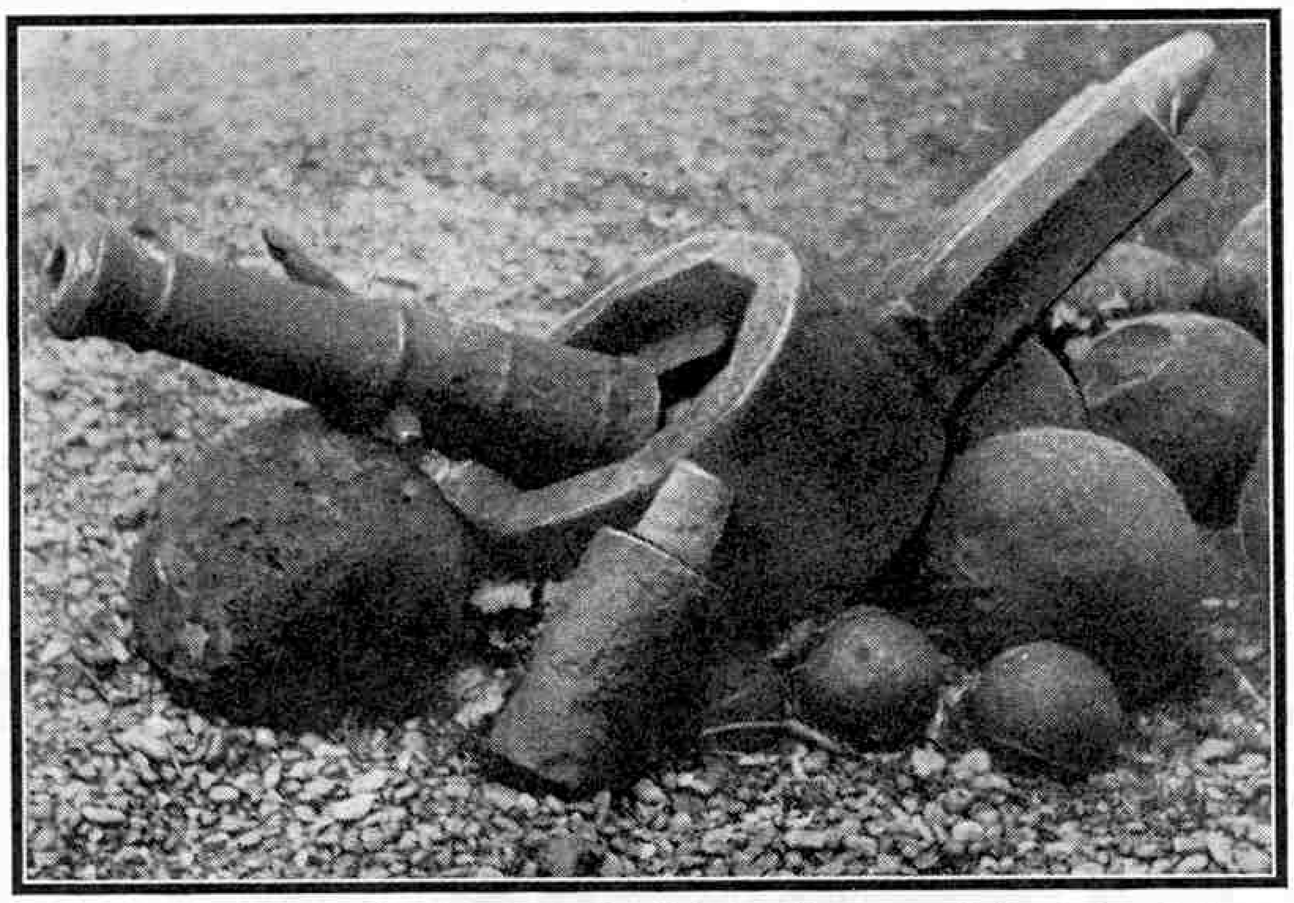
None of these old furnaces actually stands to-day, but we

have many documents relating to them, although no accurate drawings are available. One of the best of them was 24 ft. square at the base, and 30 ft. high. It was shaped like a truncated pyramid, with thick walls, and inside was approximately egg-shaped, with a rectangular hearth of considerable depth.

The bellows that were so necessary for iron furnaces were worked by hand and foot until the 14th century, when water power was substituted. The furnaces were built on the banks of the streams, for water played a great part in the Sussex iron industry. It worked not only the bellows supplying the air blast, but also the hammer that beat the iron itself in the forge.

A water-wheel drove the bellows, the arms of which were pushed down by pegs or cams arranged round a barrel rotated by the wheel. A counterweight raised the arms of the bellows in readiness for the next stroke. It was possible to tap a swift stream and run the water along wooden troughs to the wheel. A sufficient head of water usually could not be obtained directly in this manner, however, so artificial ponds, known to-day as "hammer ponds," were made by throwing up a dam, or "bay," as it was called, across a narrow deep valley. An overflow, or spillway, was constructed, with sluices that could be raised or lowered in time of flood, and if the difference in levels was considerable, a series of steps were made to break the force of the fall, and thus to avoid undermining the bay. In west Sussex the spillways were made of stone, and traces of them still survive; those in East Sussex probably were made of wood, for they have vanished without leaving a trace.

The water was carried to the wheel in oaken chutes. The supply depended entirely on rainfall, and a man-driven treadmill had to be used if this proved insufficient. Few furnaces worked all the year round, and the ironmasters probably did a little farming and other work in the slack periods.



A small cannon and other relics of the Sussex iron industry. They are now in the garden of a house on the site of Robertsbridge Abbey Forge, where they were cast.

In time the hammer ponds became silted up, and the bays then were made higher with cinder and slag. If they broke, the expense of making new ones usually was too great for the owners of the furnace.

A forge was generally erected about half a mile below the furnace, but this was not invariably the case. The forging was carried out with a tilt-hammer driven by water-power. The hammer head weighed about 8 cwt. and was hafted or fitted to the shaft or helve in the same manner as that of an ordinary household hammer. The shaft of course was much longer, measuring about 9 ft. and was pivoted to the middle of a stout framework firmly bound with iron clamps and wedges. The water-wheel turned a second wheel provided with four projecting pegs that in turn caught the shaft just below the head, lifted it and then allowed it to fall. Additional impetus was given by means of a springy, laminated length of timber against which the shaft was forced as it was raised. The rebound of the timber made the blow on the hot metal resting on the anvil more powerful than if the hammer had been allowed to fall under its own weight.

The mainstay of the Sussex iron industry was the making of cannon, and a well-known piece of doggerel tells us how, at Buxted, in 1545,

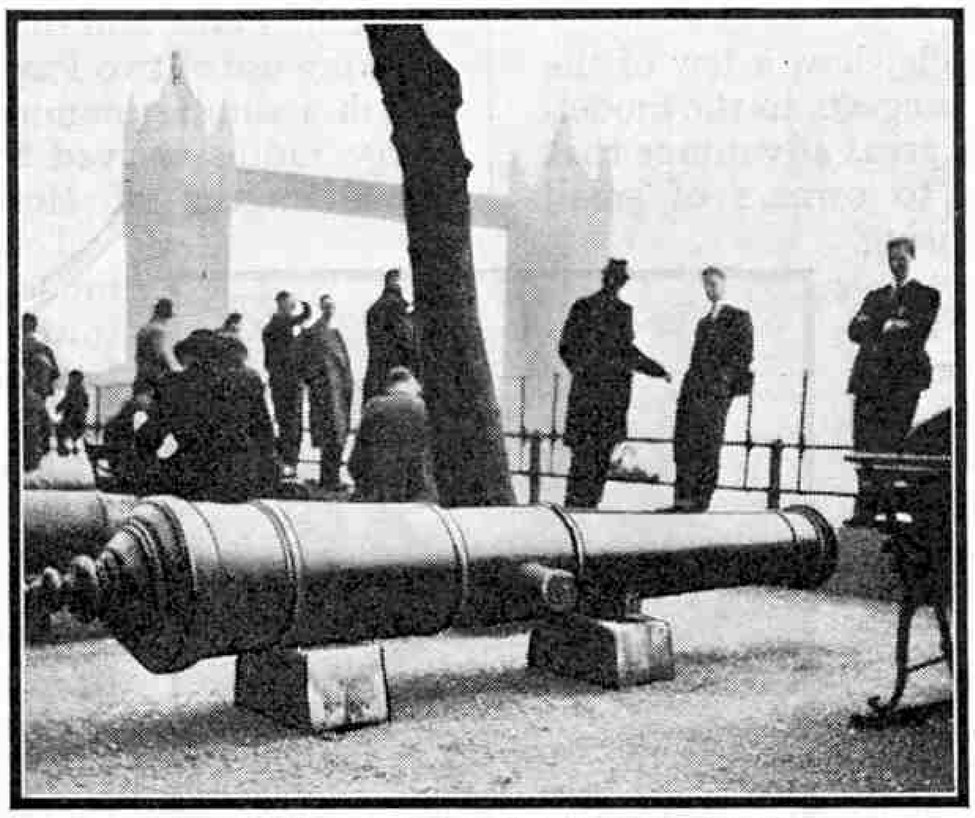
"Master Huggett and
his man John,
They did make the first
can-non."

The cores for the moulds in which the cannon were cast were made up of successive layers of straw and clay, wound on a stick. At a later time the guns were cast solid and bored.

In 1573, Ralph Hogge, the Queen's gunmaker, complained that certain ironmasters were infringing his monopoly by exporting ordnance. In the year following this complaint, a Commission of Enquiry drew up a list of Sussex ironworks and this still exists. There was much smuggling and illegal trading in those days, and some Sussex cannon makers were charged with selling their products to friend and foe alike.

Peaceful homely firebacks, now much prized by collectors, also were cast at Sussex ironworks, and iron tombstones, or rather "headirons," were other products of this old industry.

There is a popular belief that the Sussex iron industry died out because the demand for charcoal threatened forests with destruction. This is a half truth. It is true that alarmists pointed out that there would soon be no timber left to make ships for the Navy if the forests continued to be cut down at the rate necessary to provide the charcoal, and it was then arranged that so many trees per acre were to be left standing when large areas were depleted.



A gun of Sussex iron on Tower Wharf, London.

The real cause of the waning of the Wealden iron industry was the invention of smelting processes in which coke was used. Charcoal was more expensive than the new fuel, and its transport costs were high. As a result valuable Naval contracts were lost to the industry and it died out after a long history that included 2,000 years of small things, and a period of 300 years in which it was of great importance. The last furnace to be shut down was that of Ashburnham, near Penhurst, which was closed about 1820. Wm. Hobday, the last surviving worker there, died as recently as 1883.

In Search of New Models

Ideas from Seaside Holidays

THE lively scenes on the sands and promenades of a seaside resort provide many interesting ideas for model-building of the lighter and humorous type, and model-builders on holiday should keep a keen look out for suggestions for novel and ingenious models. Piers and fair-grounds of course are already well known as prototypes of many splendid reproductions in Meccano, but they do not by any means exhaust the possibilities. Pierrots, minstrels and bathers are all excellent subjects for fascinating and effective model-building, and the exciting or humorous events that are always taking place at the seaside also can be turned to good account. Meccano figures of course play a prominent part in models of this kind, and careful arrangement of the parts representing the legs and arms often will transform a simple and uninteresting subject into one that is full of life and vigour.

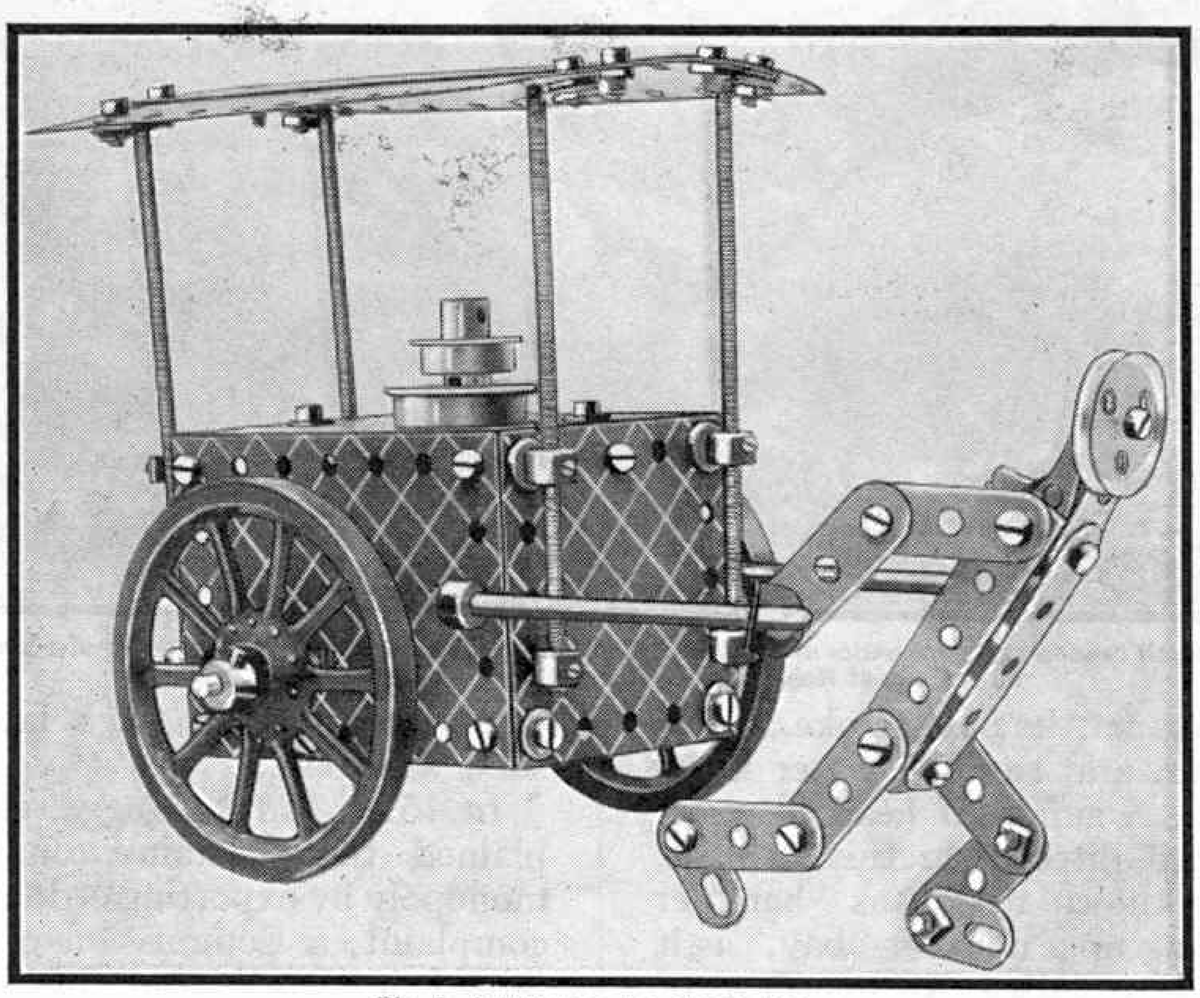


Fig. 1. A Meccano ice-cream man.

The models described in this article show a few of the many possibilities that the seaside suggests to the model-builder, and many of these have the great advantage that they offer splendid opportunities to owners of small Outfits and others who enjoy devising models of the simplicity type.

The ice-cream vendor shown in Fig. 1 is a good example of an effective seaside model, in which the construction of the barrow and of the figure accompanying it is remarkably simple. The barrow is built up from three $3\frac{1}{2}'' \times 2\frac{1}{2}''$ and two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates, Angle Brackets being used to form the connections between these Plates. The Wheels are held in position by Couplings, and Collars are used for carrying the roof supports and shafts. The curved roof is built up from two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates. The top of the ice-cream container consists of a large and a small Flanged Wheel, and this is placed on top of the barrow but is not secured in any way. The construction of the figure is typical of most Meccano models of this type. Strips of various lengths are used for the body, legs and arms, and a $1\frac{1}{2}''$ Strip surmounted by a 1" loose Pulley forms the neck and head. A neat use for the new Pawls, without boss, is that of shaping the back of the neck of this figure. The arms of course must be bent outward slightly in order that the hands, represented by $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets, can grasp the shafts. Many other humorous models can be built on similar lines.

Swimming, diving, and sunbathing are naturally the main attractions of a seaside holiday, and suggestions for a variety of new models can be obtained by watching those who take part in these pastimes. One of the most recent additions to water sport in this country is surf-board riding, and a simple, but effective model of a surf-board rider is illustrated in Fig. 2. The disposition of the Strips is of major importance in a model of this kind, for the whole atmosphere must be one of thrill and speed, and a streamline effect therefore is necessary.

The construction of the surf-board is very simple. A rectangle is first formed from two $5\frac{1}{2}''$ and two $1\frac{1}{2}''$ Strips. These support a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, and the front end of the board is curved by making use of two Pawls, without boss. The figure is built up in a similar manner to that shown in Fig. 1, but $2\frac{1}{2}''$ large radius Curved Strips are used to form the body. Two lengths of Meccano Cord represent the reins.

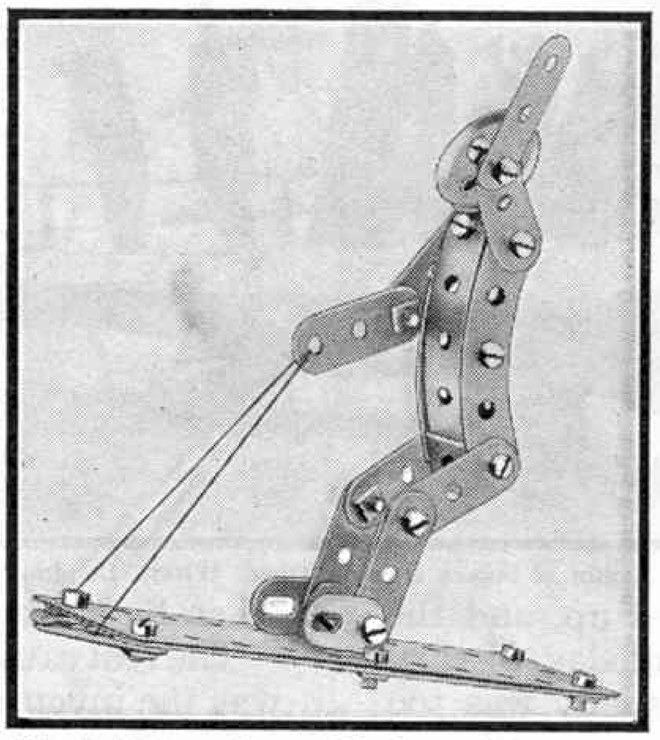


Fig. 2. A fine action model of a surf-board rider.

To increase the attractiveness of this model it is a good plan to show it being towed behind a Meccano model motor boat. The boat may be of the big cruiser type or it may be a smaller one fitted with an outboard motor. Motor boats of the second of these types are extremely popular, and many are now used for towing surf-board riders at high speed.

Surf-board riding came to this country from the South Seas, where it has been the general sport for hundreds of years. The inhabitants of these islands rely on the long Pacific rollers for carrying them and their surf-boards at high speed towards the beach. A model of a surf-rider of this type can be built in a similar manner to that shown in Fig. 2. The figure should lie flat along the board, however, and no reins need be provided.

Evenings at the sea-side may be enlivened by a visit to the pier or hall in which a concert party is performing. Here again are to be found many ideas for humorous models, and a good example is shown in Fig. 3. The figures in this represent a concertina player and a

banjoist respectively. Both are shown dressed in evening clothes, and one wears a top hat.

The construction of these figures is simple. Each consists essentially of two large radius Curved Strips, connected together by one Double Bracket the centre portion of which forms a support for a $2\frac{1}{2}$" Strip bent to the shape shown. Legs and arms are represented by $1\frac{1}{2}$" Strips, and the long boots typical of most minstrels are formed from $1\frac{1}{2}$" Strips. In both cases $1\frac{1}{2}$" Strips and 1" loose Pulleys are used for neck and head, and the top hat carried by one is built up from a short Strip and a Single Bent Strip. The concertina is a Hornby Coach Connection, the ends of which have been filled in with small pieces of black cardboard cut to the required shape. This use of the Hornby Coach Connection is ingenious and effective and no doubt Meccano model-builders will find many other uses for it. The appearance of the model can be much improved by painting in a key board and stop manual on the "concertina."

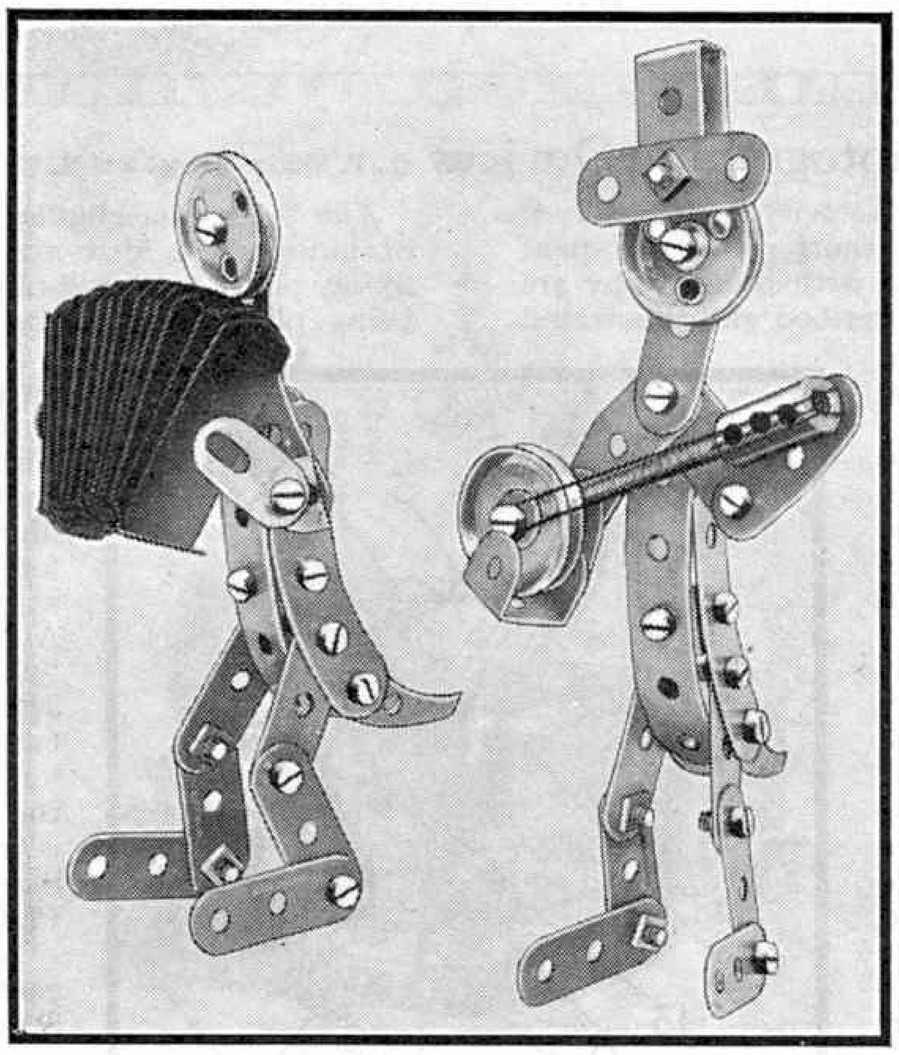


Fig. 3. A humorous minstrel troupe.

The banjo carried by the second figure can easily be built up from a 1" fast Pulley fitted with a 2" Screwed Rod. The Rod is fitted in one of the holes in the boss of the Pulley, and is locked in position by the set-screw. The upper end of the Rod is fitted with a Threaded Coupling locked in position by a nut, and a bolt is used to connect the Threaded Coupling with the $1\frac{1}{2}$" Strip forming one arm of the figure. Banjo strings can be suitably represented by Meccano Cord.

These two models do not of course exhaust all the possibilities of stage shows and minstrel troupes. A model submitted in a recent competition is worthy of note. It was a miniature reproduction of a complete pierrot show, and the entire stage and seating accommodation were included. Marionettes operated by the builder of the model presented a variety concert and provided many hours of good fun both for the owner and his friends. No doubt many other Meccano enthusiasts will find the idea of sufficient interest to include in their future model-building programmes.

Illustrated post-cards sent by friends from the sea-side often have humorous sketches as their frontispiece. Here again are ideas suitable for reproduction in Meccano, and Fig. 4 gives some idea of possibilities of this kind. This model represents the traditional fat man on a thin donkey, and the hollow back of the animal is a graphic illustration of the evils of such a combination.

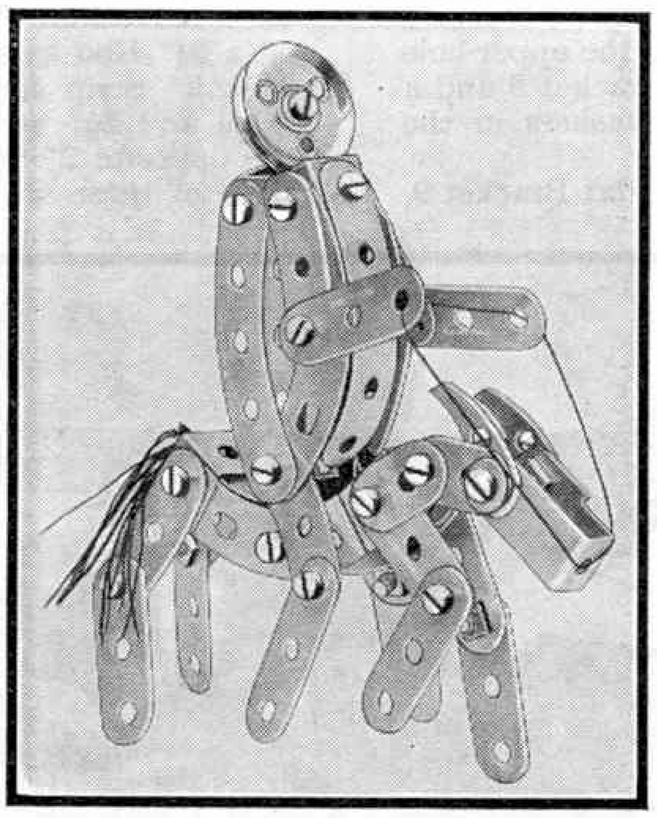


Fig. 4. An unfortunate Meccano donkey carrying a heavy load.

Careful arrangement of the legs, head, and ears of the donkey give a very humorous appearance to the model, and a final touch consists of a tail formed from a bundle of Meccano Cords. In this model use is again made of Pawls, without boss. They represent the ears of the animal and in the position shown in the illustration suggest stubbornness and temper.

The man mounted on the donkey is made to appear as fat as possible by making good use of Curved Strips. In front he is built up from two $2\frac{1}{2}$" small radius Curved Strips, and his back is formed of two $2\frac{1}{2}$" large radius Curved Strips. The space between each pair of Curved Strips is filled in by means of $2\frac{1}{2}$" and $1\frac{1}{2}$" Strips bent to the required shape.

Beach camera men and novelty hawkers can be reproduced in Meccano with excellent effect. Typical scenes of a few years ago also are attractive. Clumsy-looking bathing huts mounted on four massive wheels were the most conspicuous objects of old-style beach scenes, and these are specially effective when contrasted with representations of modern seaside resorts and the people who throng to them.

One aspect of model-building that has so far been very much neglected is the construction of miniature swimming baths. Of recent years swimming has become increasingly popular, and open-air and indoor baths have been instituted for the benefit of those who find seabathing rather boisterous. These baths feature largely in holiday advertising and so many photographs from every conceivable angle are available that the model-builder need never be at a loss when designing such a model. The high diving boards and the other structural portions of these models lend themselves admirably to reproduction in Meccano, and by the judicious use of Strip Plates and Flexible Plates excellent models of cubicles and galleries can be built. Extra interest is added by the addition of handrails, offices and entrances provided with turnstiles, and green rippled glass is an excellent substitute for water.

A glance through holiday catalogues issued by all railway companies and town authorities will result in a surprising crop of further ideas, for the photographs and pen sketches found in many of these publications give many aspects of holiday life by the sea. Plan views of gardens and promenades are to be found in great variety, and reproductions of these seldom fail to attract interest.

A purely structural model can readily be given a lively appearance by the addition of miniature figures carrying out suitable movements. For example, divers and sun-bathers can be included in a model swimming pool, the divers being suspended by lengths of cotton from the high diving board. The figures are constructed in a similar manner to the surf-board rider shown in Fig. 2, but in many cases the arms will have to be secured in place by means of $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets. Figures of spectators can also be added with good effect, and in this direction there is considerable scope for the ingenious model-builder.

Meccano Suggestions Section

By "Spanner"

(356-7)—Photographic Devices (L. P. Storey, Bristol and R. M. Smith, Stanmore)

Spring and summer bring with them great activity in the ranks of photographers, and gadgets that are likely to shorten the time spent in carrying out the routine work associated with their hobby are always acceptable. The two mechanisms described and illustrated in this section have been designed for the purpose of eliminating tedious work of this kind.

The first of these mechanisms will be appreciated by those who develop their own roll films, for it gives the necessary movements to films that are being developed. It also can be adapted to rock a photographic dish in which films and prints are being fixed.

The construction of the apparatus is fairly simple and is commenced by building up a rectangle from two 12½" Angle Girders and two 5½" Angle Girders. An additional 5½" Angle Girder is bolted in place between the two 12½" Angle Girders 1, Fig. 356. Two 5½"×2½" Flanged Plates are now fitted, and these form supports for an Electric Motor.

A ½" Pinion on the armature shaft of the Motor meshes with a 57-teeth Gear 2, and this drives at a slow speed the shaft 3 through the medium of four 3 : 1 reduction gears. Each stage of reduction consists of a ½" Pinion and a 57-teeth Gear. The shaft 3 is journalled in reinforced bearings formed from two Cranks, and carries at one end a Rod Socket 4. This part is used as a right-angle connection, and in it is locked the 3½" Rod 5.

A second Rod Socket is carried on the 2½" Rod 5, and this forms a support for a short Rod 6 on which are mounted three 1" loose Pulleys. These are spaced apart by two Washers each, and are prevented from slipping sideways along the Rod by means of two Collars.

A 5½"×3½" Flat Plate fitted as shown, supports at one corner a 3½" Rod 7, the opposite end of which is journalled in the upper hole of a 3½" Strip 8. On the Rod are mounted a Flat Bracket 9 and a second set of three 1" loose Pulleys spaced by Washers in the same manner as those mounted on the Rod 6.

The operating cord is attached at one end to the Flat Bracket 9, and is then passed alternately round the Pulleys on the Rod 6 and the Pulleys on the Rod 7. The resulting arrangement is similar in every respect to a three sheave pulley system. The free end of the cord is clamped to the 1½" Strips 10, which also are attached to a cord 11 that passes over the two Pulleys 12, and carries at its lower end a large bull-dog clip. Two clips are required, one being attached to the Plates 10a. The film to be developed or fixed is clipped at each end and allowed to hang in a loop dipping into the developing or fixing solution. As the arm 5 rotates, the cord passing round the Pulleys is alternately lengthened and shortened and produces the required see-saw movement of the film. A Flywheel on the armature shaft of the Electric Motor prevents undue variations in the speed of the apparatus.

A Pulley 13 is fitted in order to adapt the movement to the rocking of the dishes used. When the model is used for this purpose the cord is passed round only one set of Pulleys, that is, round one Pulley on the Rod 6 and one on the Rod 7. The Rod 6 is moved inward along the Rod 5 until its travel is about ½". After passing round the Pulley 13 the cord is attached to a platform carrying the developing dish.

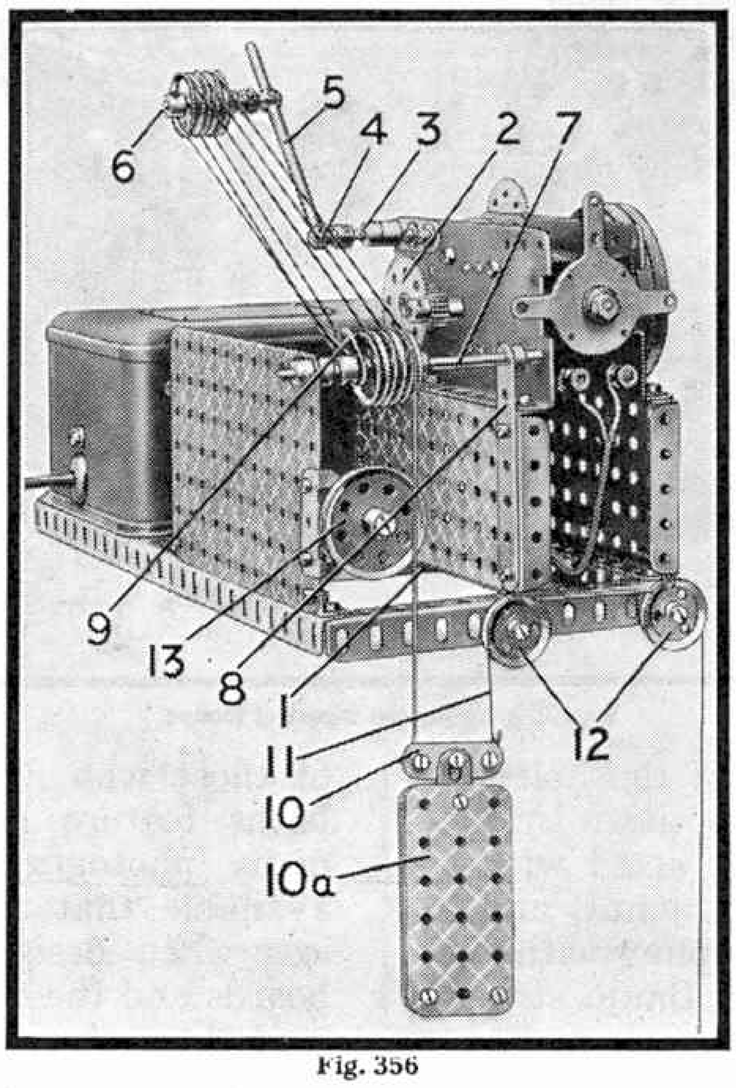


Fig. 356

The second mechanism, Fig. 357, submitted by R. M. Smith, Stanmore, is a dish rocker for use when developing plates, or fixing plates and roll-films. Films must of course be cut before being placed in the dish.

The device is built by bolting together two 9½" Angle Girders and two 5½" Angle Girders to form a framework. Three further Girders are secured in place across this framework in the positions shown in the illustration, and two of these form supports for two 3½"×2½" Flanged Plates that carry at their upper ends a 2½"×2½" Flat Plate. A 2½"×½" Double Angle Strip 1 also is bolted to the Flanged Plates. A third 3½"×2½" Flanged Plate is secured to the base of the model, and this forms a support for two ½"×½" Angle Brackets that carry the ends of two 4½" Strips, one of which is shown at 2. The other ends of these Strips are bolted to the two central Flanged Plates.

An E1 Electric Motor drives a 57-teeth gear that is mounted, together with a 1" Sprocket 4, on a 3½" Rod. The 1" Sprocket is connected to a similar part on the Rod 5 by means of a length of Sprocket Chain. A ¾" Pinion is mounted on the same Rod as the last mentioned Sprocket, and this is meshed with a 50-teeth Gear 6. A ½" Pinion on the same Rod as the Gear 6 engages with a 1½" Contrate Wheel locked on the Rod 7 that carries a Worm, driving two Bush Wheels 8 by means of a ½" Pinion 9.

Each Bush Wheel 8 carries a Threaded Pin that forms a pivot for the lower end of a 2½" Strip 10, and the upper end of this Strip is lock-nutted to a horizontal 7½" Strip. The 7½" Strip is pivotally mounted on a 3½" Rod as shown, and carries at its free end a 2" Strip 11. This 2" Strip forms the link connection between the rocking table and 7½" Strip. It is connected to the table, together with the opposite 2" Strip, by a 6½" Rod, Collars being used on both sides of these strips to prevent side movement.

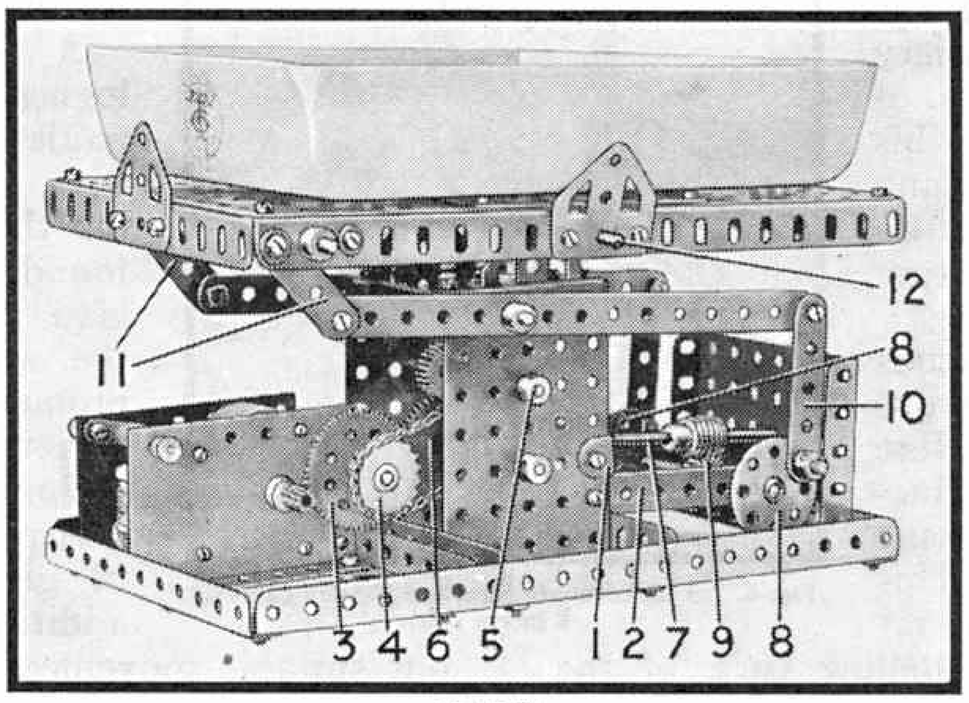


Fig. 357

The framework of the rocking table is built up in a similar manner to the base of the model, but is filled in by means of three 5½"×3½" Flat Plates. It is fitted with a Flat Trunnion on each side, and each of these can be adjusted slightly to prevent the dish from sliding. The complete table is pivoted at its centre on a 6½" Rod 12.

The range of movement of the table on which the dish is carried can be adjusted by altering the position of the Strips 11. These Strips are secured, as already described, by means of a 6½" Rod journalled at each end in the centre hole of a 1½" Strip bolted to the side Girders of the table. By replacing the 1½" Strips with longer ones it is possible to alter the position of the 6½" Rod. In this way the leverage between the Strips 11 and Pivot 12 can be increased or decreased, and the movement of the dish varied proportionately.

It is inadvisable to fill the photographic dish to capacity. Only sufficient solution for the purpose should be used, and in order to protect the Meccano parts from possible damage by the solution a layer of felt should be placed on top of the table. The speed of rocking can be controlled by incorporating a Resistance Controller between the motor and the source of the current driving it.

(358)—Clock Escapement (J. Wheldon, Newcastle-on-Tyne)

Meccano clocks always excite great interest among Meccano model-builders, who are continually experimenting and trying out new ideas. Among the novel devices recently submitted is a Meccano Escapement, by J. Wheldon, Newcastle-on-Tyne, in which an attempt is made to increase the length of run of a Meccano clock by making use of an escapement wheel with a large number of teeth.

Fig. 358 shows this mechanism, which is extremely simple to construct. The escapement is a 2″ Sprocket Wheel, and this is mounted on the final shaft of the clock gear-train. The pallet is built up from a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip that is attached by means of two $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets to two Cranks. The Angle Brackets are bolted together to form a double bracket, and the Cranks are locked on the ends of two short Rods. The outer ends of the two Rods are carried in suitable bearings mounted on the frame of the model clock, and great care is necessary when fitting these to see that they are exactly in line. In the illustration only one bearing is shown in order to make the construction and pallet setting quite clear.

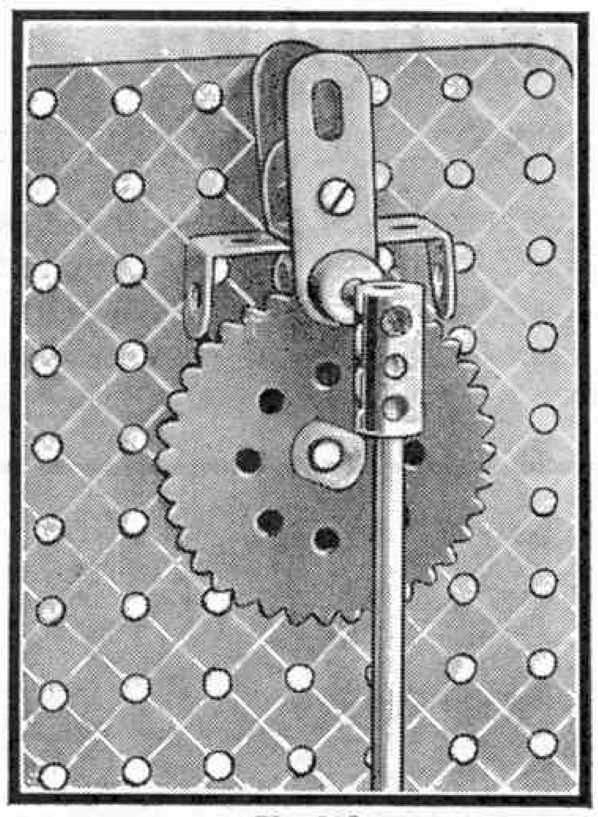


Fig. 358

The crutch is locked on the end of one of these two Rods, and is built up in a similar manner to that incorporated in the Super Model Grandfather Clock, Leaflet No. 14a. Care must be taken when adjusting the ends of the Double Angle Strip, and the exact position of the pallets in relation to the escapement wheel must be gauged very accurately. Correct adjustment is best accomplished by mounting the entire clock mechanism on screw feet.

The builder claims many advantages for this movement. The chief of these are compactness, and long running. The mechanism also is remarkably silent and absorbs very little of the initial power.

(359)—Intermittent Motion

(K. Robinson, Fishguard)

By means of this mechanism, submitted by K. Robinson, Fishguard, intermittent motion of almost any duration and in a variety of sequences can be imparted to a rotary rod. As will be seen on reference to Fig. 359, a 57-teeth Gear fitted with four Threaded Pins is mounted on a Pivot Bolt and driven by means of a Worm that is in constant engagement with the Gear. The Worm is mounted on a Rod that is rotated from a shaft, running at right-angles to it, by means of a pair of $\frac{7}{8}''$ Bevel Gears. The end of the Rod protruding from the Worm carries one half of a Dog Clutch, the other portion being secured to the inner end of a sliding Rod.

As the Rod driven by the Bevel Gears rotates, the Threaded Pins on the 57-teeth Gear push forward a second sliding Rod attached by Cranks to that carrying one half of the Dog Clutch. A compression spring on this Rod returns the Dog Clutch into engagement as the pressure of each Threaded Pin in turn is released. The number and disposition of the Threaded Pins decides the sequence of the intermittent movement of the rotating Rod.

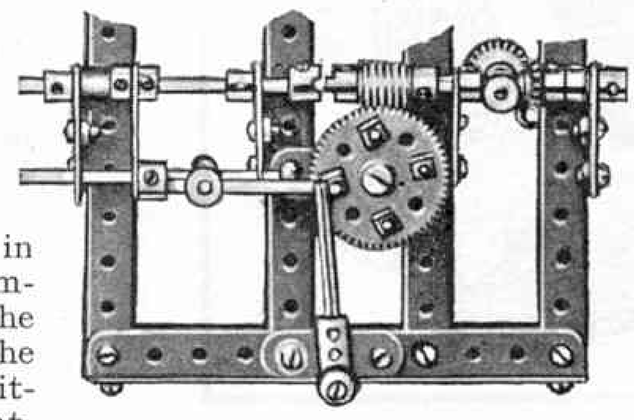


Fig. 359

The short Rod that is mounted approximately at right angles to the sliding Rod is carried in a Coupling that is free to turn on a short vertical Rod. It is held in position by Collars on the vertical Rod, which is secured to the base by means of a Double Arm Crank. The ends of the sliding shaft and the pivoted Rod are in contact with each other during the period that a Threaded Pin is moving the two Dog Clutches out of engagement. At other times the pivoted Rod is free.

(360)—A Novel Display Mechanism

(F. Barlow, Rhyl)

The special window display mechanism illustrated in Fig. 360 has been submitted by F. Barlow, Rhyl, who made use of it in a large advertising model. In this a large drum carrying advertising slogans had to be rotated so that each slogan appeared for a period in an opening cut in the background of the display. The mechanism was built entirely of Meccano parts.

The drum is mounted on a long Rod 1, on one end of which is locked a Face Plate 2, carrying four Threaded Pins, which engage with a built-up hook 3. This hook is bolted on the lower end of a compound Strip 4 pivotally attached at its upper end to a second Face Plate 5 that is driven at a slow speed by an Electric Motor.

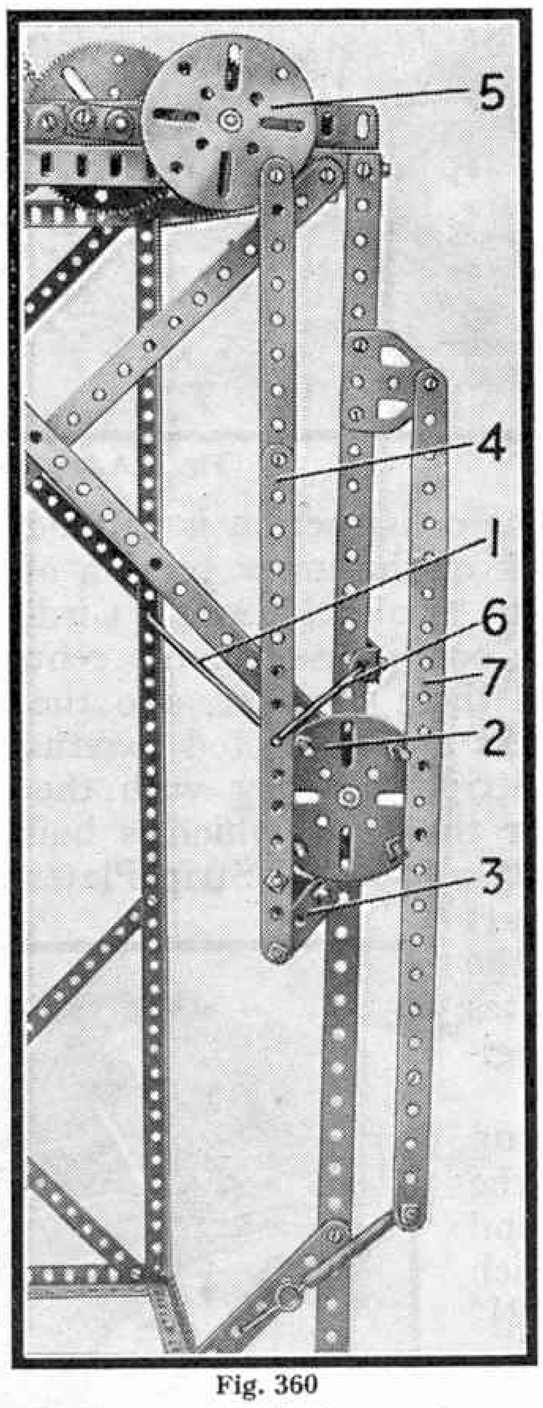


Fig. 360

The Strip 4 is held in engagement with the Threaded Pins by a short length of Spring Cord 6. A $12\frac{1}{2}''$ Strip is fitted in order to prevent the drum rotating after receiving an impulse from the hook 3, and this is held in engagement with the Threaded Pins by a Spring. As the Hook 3 is raised by the Face Plate 5 it engages with one of the Threaded Pins in the Face Plate 2, and lifts it. As the Hook descends it rides over the bottom Threaded Pin.

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(M.190.) A Built-up Eccentric.—In the construction of very large Meccano model steam engines, the fitting of Eccentrics of suitable size is a point of considerable importance. Meccano Eccentrics are often too small, but W. Avory, London, W.11, has succeeded in building up an Eccentric that works satisfactorily and has a good appearance. It can be recommended to any Meccano model-builders who have experienced difficulty in constructing a suitable unit of this type.

The suggested Eccentric consists of a 2″ Pulley, across the centre of which is bolted a Crank. The boss of this Crank is in line with one of the round holes in the Pulley, and the groove of the latter accommodates a "strap" that is built up from three $2\frac{1}{2}''$ small radius Curved Strips. When these Curved Strips are in position, a gap of $1\frac{1}{2}''$ exists between the ends of the strap they make. This is bridged by a Flat Trunnion, the apex of which points outwards, away from the centre of the 2″ Pulley Wheel. The Connecting Rod is bolted at one end to the Flat Trunnion, and at the other it is linked-up with the valve or valve-gear. Before being used, the groove of the Pulley and the "strap" must be thoroughly lubricated.

(M.191.) Creeper Track.—The fitting of creeper tracks to Meccano models of tanks, tractors, etc., continues to interest Meccano Model-builders. The latest suggestion in this connection has been submitted by G. Garvey, Redcar, Yorks., who has made use of elastic trouser belts in order to represent the caterpillars of his model tractor.

The belts were obtained for a few pence from the local general stores and were then cut down the centre into two strips. The two ends of each strip were then cut square and joined together by means of a strip of adhesive rubber similar to that supplied in cycle puncture repair outfits. The complete track passes round two large diameter wheels of double width, one of which must consist of Pulleys fitted with Meccano Dunlop Tyres and must be coupled-up inside the tractor to the driving motor. The rear set of wheels carrying the belt may consist of Sprocket Wheels, Pulleys or Wheel Flanges and, if desired, an intermediate jockey pulley can be fitted to take up slackness. A device of this kind is to be found in nearly all modern, high-speed tanks and tractors. A 1″ Pulley carried in a spring-mounted framework will be found suitable for use with this Caterpillar Track, and is easily fitted. This Pulley is so placed that it presses on the inner surface of the track between the main front and rear Pulleys.

New Outfit Models

Ideas for Small Outfit Builders

THE new models to be described this month are intended primarily for boys who possess medium sized Outfits. Two of the models are fitted with Meccano Clockwork Motors, and the Breakdown Lorry can readily be fitted with a Meccano *"Magic Motor"* if desired.

The first model, illustrated in Fig. 1, has as its prototype one of the train-ferries that operate between Ipswich and Ostend. The model is built with Outfit E, and its appearance can be greatly improved by the addition of a number of Dinky Toy Coaches, the scale of these Coaches approximating to that of the train-ferry. The construction is commenced by building the framework of the lower portion of the hull. Each side consists of two $12\frac{1}{2}''$ Angle Girders 1 overlapping 15 holes. One bolt is used in the centre of these two Girders to hold them together, and the two complete compound Girders are connected together by three $5\frac{1}{2}''$ Strips. These Strips, together with the side Girders, form supports for the deck, which is built up from two $12\frac{1}{2}'' \times 2\frac{1}{2}''$, and two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates and one $12\frac{1}{2}''$ Strip. This last part fills in the gap between the two $12\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates that are arranged longitudinally on the deck.

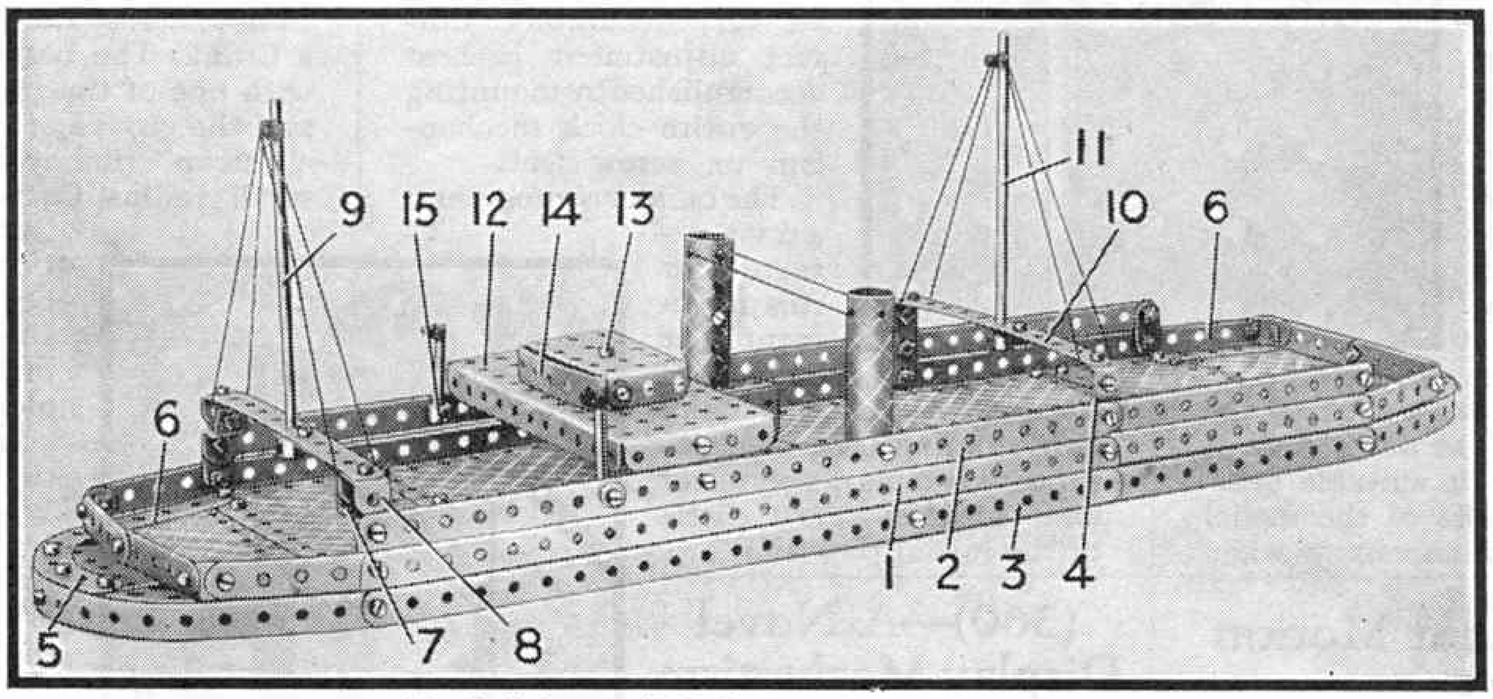


Fig. 1. A fine model Train Ferry built with Outfit E.

The sides of the model are increased in depth by the addition of two compound strips 2 and 3 each of which is formed from two $12\frac{1}{2}''$ Strips overlapping 15 holes. They are attached to the Girders 1 by Flat Brackets at each end on the top, and Angle Brackets are used on the undersides. The $1\frac{1}{2}''$ Strips 4, carrying the after bridge, also help to secure the upper Strips 2 in position.

At each end of the Strips 3, two $5\frac{1}{2}''$ Strips are bent to form the bows and stern, and where these are connected together an Angle Bracket is fitted in place to form a support for the $2\frac{1}{2}''$ large radius Curved Strip 5. This is bolted at each end to a $2\frac{1}{2}''$ small radius Curved Strip that carries a $2\frac{1}{2}''$ Strip 6. The ends of the Girders 1 are extended by $2\frac{1}{2}''$ Strips that carry $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets forming supports for two $2\frac{1}{2}''$ Strips bolted together and overlapping one hole. These Strips represent the barriers fitted to the actual vessel, when under weigh.

Two $\frac{1}{2}''$ Reversed Angle Brackets 7 are now fitted and each of these carries a Double Bracket 8. The two Double Brackets form supports for a $5\frac{1}{2}''$ Strip that carries at its centre a Crank supporting the fore-mast, a $4\frac{1}{2}''$ Rod 9. A second bridge, built up from a $5\frac{1}{2}''$ Strip 10 supported at each end by Angle Brackets, is secured to the $1\frac{1}{2}''$ Strips 4, and it carries at its centre a Crank in the boss of which is gripped a Rod 11, forming the after-mast. The rigging is represented by short lengths of Meccano Cord secured to the masts by clips.

The bridge is built up from a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 12 bolted to the Strips 2 by Flat Brackets in the position shown in Fig. 1. To the upper side of this Flanged Plate is bolted a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate by means of a $\frac{3}{4}''$ Bolt 13, and a curved Double Angle Strip 14 is used to represent the front of the bridge proper.

The addition of ventilators and funnels is all that is required to complete the model. Each ventilator is represented by a $1\frac{1}{2}''$ Rod carrying a Spring Clip, held in a vertical position by a Collar 15. The funnels are each built up from a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate bent round into the form of a short tube, and when complete they are braced together as shown by two short lengths of cord.

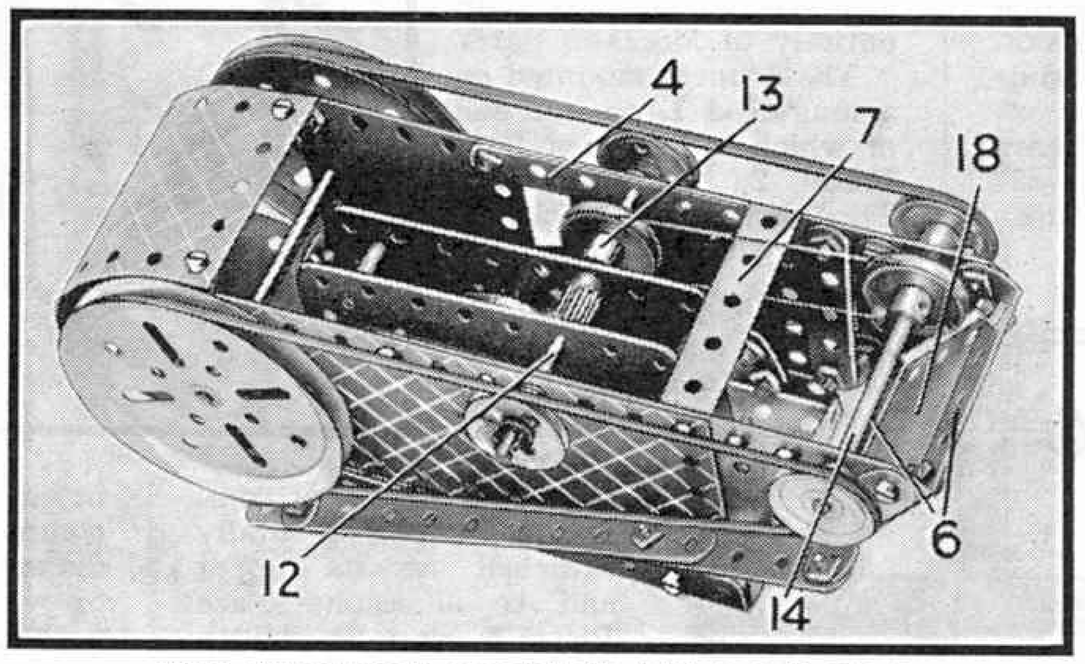


Fig. 2. An underneath view of the Tank illustrated in Fig. 4.

Parts required to build the Train Ferry: 8 of No. 1; 11 of No. 2; 2 of No. 6a; 4 of No. 8; 6 of No. 10; 2 of No. 11; 12 of No. 12; 4 of No. 12c; 2 of No. 15; 2 of No. 18a; 3 of No. 35; 85 of No. 37; 6 of No. 37a; 6 of No. 38; 5 of No. 48a; 1 of No. 51; 1 of No. 52; 2 of No. 59; 2 of No. 62; 2 of No. 90; 4 of No. 90a; 1 of No. 111; 5 of No. 111c; 2 of No. 125; 1 of No. 176; 2 of No. 188; 2 of No. 190; 2 of No. 191; 2 of No. 195; 2 of No. 197.

In Fig. 3 is shown a model Caterpillar Tractor built with Outfit D. This model is driven by a No. 2 Clockwork Motor and is representative of many farm tractors used on the great farms of Canada and South America. The construction of the model is commenced by building the main side members 1 and 1a, the $5\frac{1}{2}''$ Strips 1a being secured to the $3\frac{1}{2}''$ Strip 1 by two Flat Brackets. Two further Flat Brackets form the connections between the $5\frac{1}{2}''$ Strip 2 and the Strip 1a. Two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips held in place by the bolts 3 and 4 are used to connect the two complete side members together. A $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate held in position by the

Bolts 5 is used to represent the rear platform, and it forms also a third strengthening piece between the main frames.

The side of the model not seen in the photograph is built up from a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plate and a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate, part of which is shown at 6. The lower edge of the large Strip Plate is attached by bolts to the $5\frac{1}{2}''$ Strip opposite to 2. The near side of the Tractor is built up in a slightly different manner in order to expose the winding spindle of the Clockwork Motor.

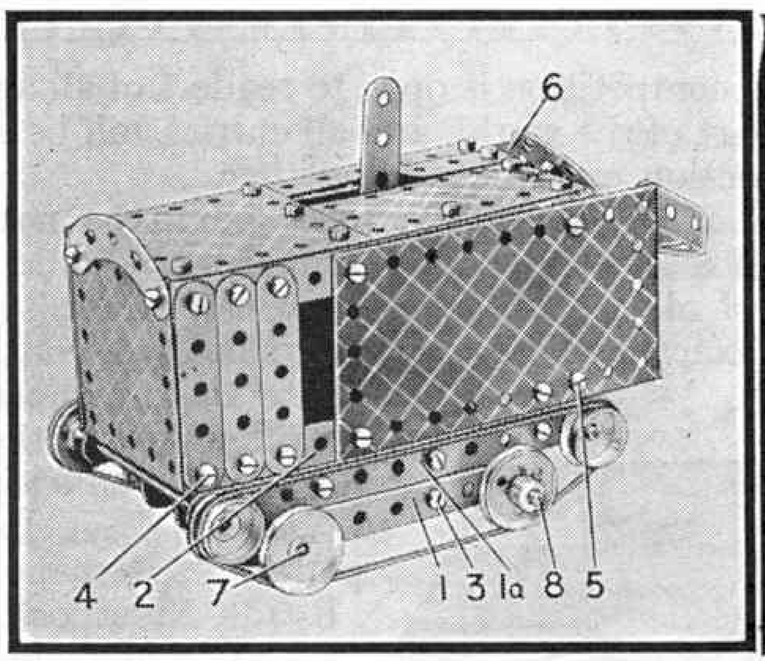
The Motor is supported by passing two Rods 7 and 8 through the Strips 1, and through the next to end holes in the bottom edges of the Motor side plates. The Rod 7 carries a 1″ fast Pulley inside the main frames of the model, and this is connected by a driving band to a 1″ Pulley on the driving spindle of the Clockwork Motor. The 1″ Pulleys on the outer ends of the Rod 7 transmit the drive to the endless tracks, which may be represented by large Meccano driving bands or lengths of Cord.

Parts required to build the Caterpillar Tractor: 7 of No. 2; 2 of No. 3; 4 of No. 5; 1 of No. 6a; 2 of No. 10; 7 of No. 12; 1 of No. 12c; 4 of No. 16; 4 of No. 20b; 4 of No. 22; 2 of No. 22a; 1 of No. 24; 45 of No. 37; 14 of No. 38; 3 of No. 48a; 1 of No. 51; 2 of No. 59; 1 of No. 90a; 1 of No. 111c; 1 of No. 126; 1 of No. 189; 3 of No. 190; 1 of No. 191; Clockwork Motor No. 2; 2 large Driving Bands (not included in Outfit).

The next model to be described is a Tank, shown in Fig. 4. This is built with Outfit D, and is driven by means of a No. 1 Clockwork Motor. Fig. 2 shows an underneath view of the model. The side of the tank seen in Fig. 4, consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plate fitted at its lower edge with a $5\frac{1}{2}''$ Strip 1. This Strip overlaps for a distance of four holes, and it carries a $2\frac{1}{2}''$ Strip 2 together with a $1\frac{1}{2}''$ Strip. The compound Strip 3 is bolted at its upper end to Strip 2, and at its lower end to the end of the Strip 1. The opposite side of the model is shown in Fig. 2. This consists of two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates secured together by means of a $5\frac{1}{2}''$ Strip 4, and the rear is built up in a similar manner to that described for the side shown in Fig. 4.

As will be seen from Fig. 2, three $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips 6 and 7 form connections between the two sides of the model. The Double Angle Strips 6 carry a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate 8, and this represents the sloping rear portion of the model.

The Clockwork Motor is held in position in the model by the Rod 12, Fig. 2, and is prevented from turning round the Rod by the top edges of the side plates bearing lightly against the underside of the Flanged Plate 5.



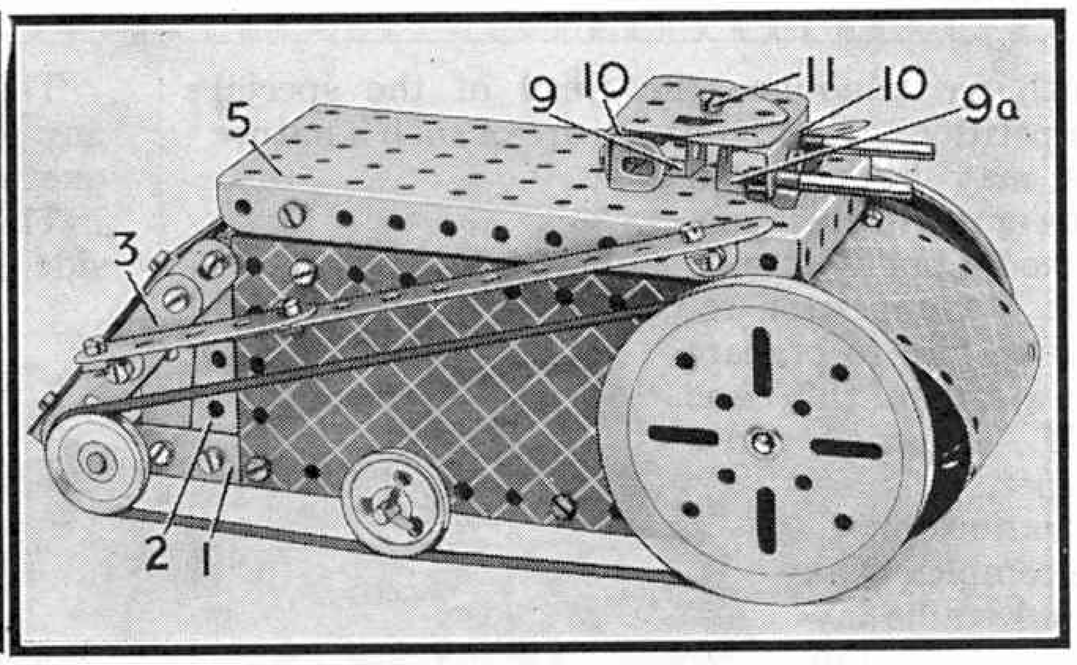


Fig. 3. (Left) The construction of this model Tractor is described in this article.
Fig. 4. (Right) A neat model Tank built with Outfit D.

The driving spindle of the Motor is replaced by the Rod 12 and it carries a 1″ fast Pulley 13. The ends of this Rod are fitted with 1″ loose Pulleys held in place by Spring Clips and spaced away from the sides of the model by five Washers. The Pulley 13 drives a second similar Pulley mounted on the Rod 14 by a length of Cord. Each end of the Rod 14 carries a 1″ fast Pulley that drives the caterpillar track formed from a large Meccano driving band. At the front of the tank this band passes round a 3″ Pulley.

Parts required to build the Tank: 4 of No. 2; 6 of No. 5; 2 of No. 6a; 8 of No. 10; 2 of No. 11; 8 of No. 12; 3 of No. 16; 2 of No. 18a; 2 of No. 19b; 4 of No. 22; 2 of No. 22a; 6 of No. 35; 52 of No. 37; 12 of No. 38; 1 of No. 40; 3 of No. 48a; 1 of No. 52; 2 of No. 126; 2 of No. 126a; 3 of No. 190; 1 of No. 192; 1 of No. 195; No. 1 Clockwork Motor, 2 large Driving Bands (not included in Outfit).

The last model to be described is a simple reproduction of a Motor Breakdown Lorry, built with Outfit B. Much additional fun can be gained by fitting a Meccano *"Magic Motor"* to the underside of this lorry, and connecting it up to a 1″ Pulley on the rear axle by means of a short length of Cord.

The model is begun by joining together a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate and a Flanged Sector Plate by means of two $5\frac{1}{2}''$ Strips. Each side of the crane is built up from two $5\frac{1}{2}''$ Strips arranged in the manner shown in Fig 5, and the upper end of the jib carries a 2″ Rod on which is mounted a $\frac{1}{2}''$ loose Pulley. This Pulley and the Rod are prevented from moving laterally by four Spring Clips. Each side of the lorry is represented by $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, and two of the upper holes of this carry a Crank Handle round which is wound a length of cord. The cord passes over the $\frac{1}{2}''$ Pulley at the top of the jib and is fitted with a Small Loaded Hook at its outer end.

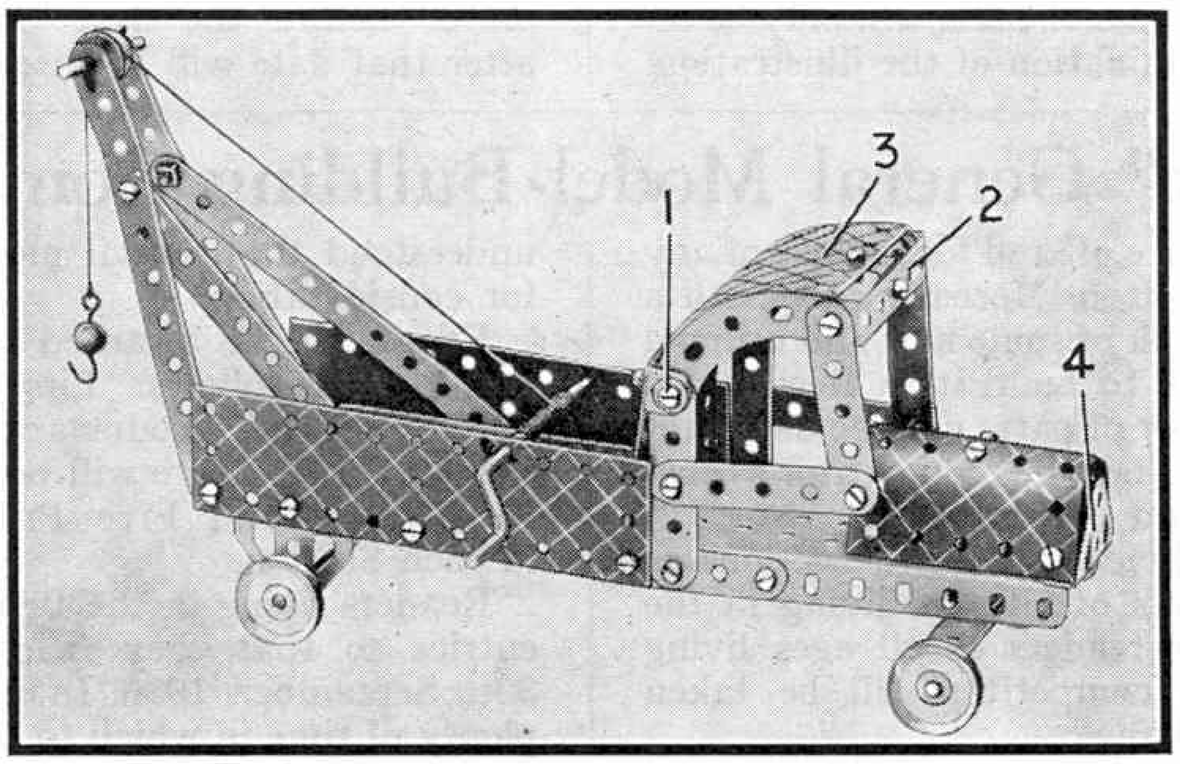


Fig. 5. A simple Meccano Breakdown Crane.

The cab is built up at each side from three $2\frac{1}{2}''$ Strips and one $2\frac{1}{2}''$ small radius Curved Strip. Two Angle Brackets 1 and a Double Angle Strip 2 secured in the position shown form points of attachment for a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate. The bonnet is built up from a Trunnion 4 and two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates joined by an Obtuse Angle Bracket.

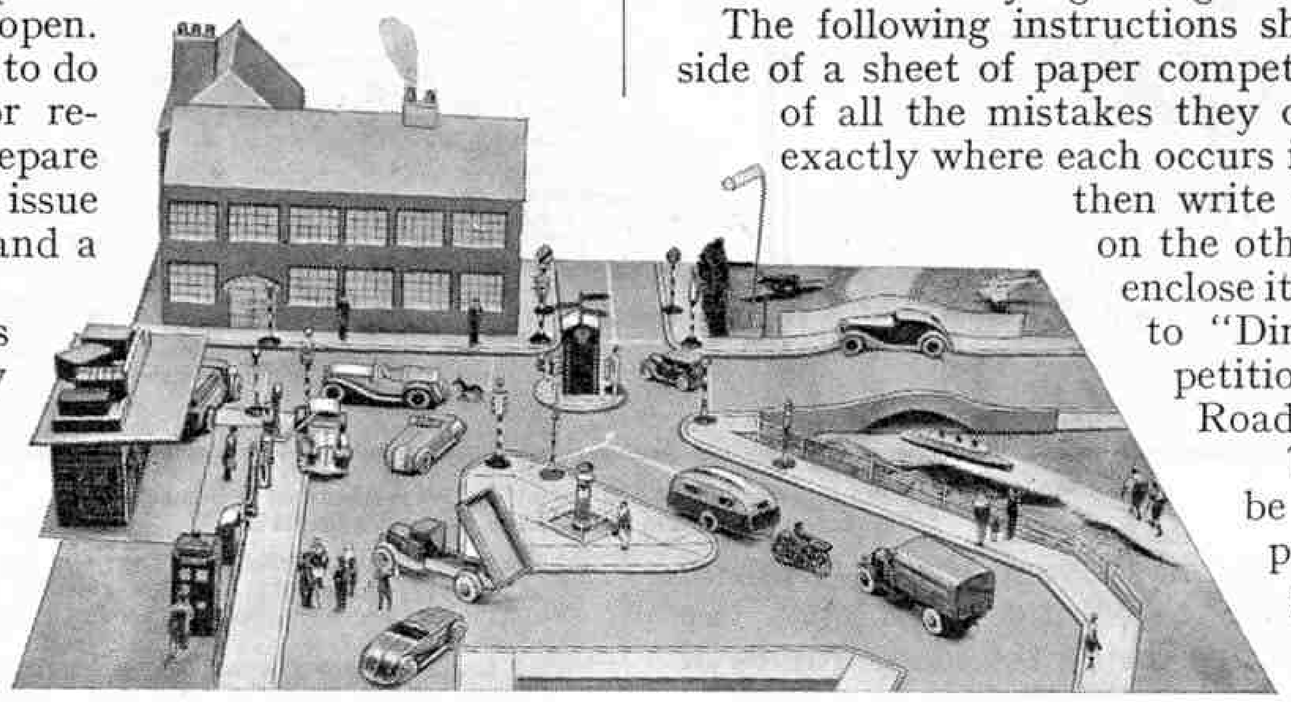
Parts required to build the Breakdown Lorry: 6 of No. 2; 6 of No. 5; 1 of No. 11; 5 of No. 12; 2 of No. 16; 1 of No. 17; 1 of No. 19s; 4 of No. 22; 1 of No. 23; 6 of No. 35; 32 of No. 37; 2 of No. 37a; 5 of No. 38; 1 of No. 40; 2 of No. 48a; 1 of No. 52; 1 of No. 54a; 2 of No. 90a; 1 of No. 111c; 1 of No. 126; 2 of No. 126a; 2 of No. 188; 2 of No. 189; 1 of No. 191.

Competitions for All Readers

A Novel "Dinky Toys Layout" Competition

This month we announce the third of the special summer competitions. These contests are of such a nature that entries may be prepared either indoors or out in the open. There is no model-building to do and all that a competitor requires to enable him to prepare his entry are a copy of this issue of the *"M.M.,"* a pencil, and a sheet of paper.

The illustration on this page shows a complex Dinky Toys road and traffic layout, which is fully equipped with various Road Signs, Traffic Signals, Motor Vehicles, and other appropriate items from the Dinky Toys Series. In designing the layout and arranging the traffic several ridiculous mistakes have purposely been made. For example, some of the Road Signs are in the wrong places and Traffic Signals are facing the wrong directions. If the illustration is carefully studied a large number of other errors will become apparent, and readers are invited to test their powers of observation by trying to find as many of these as possible. Many of the mistakes are obvious and will be seen at a glance, but some of them will only be revealed by a very careful examination of the illustration.



Numerous errors have been made in the arrangement of this Dinky Toys traffic layout and prizes are offered to readers who can find the greatest number. Full details of the contest are given on this page.

The competition is open to readers of all ages, living in any part of the world, and all entries will be grouped into one section and judged together.

The following instructions should be noted. On one side of a sheet of paper competitors should make a list of all the mistakes they can "spot," and explain exactly where each occurs in the layout. They must then write their name and address on the other side of the sheet, and enclose it in an envelope addressed to "Dinky Toys Layout Competition," Meccano Ltd., Binns Road, Liverpool 13.

The following prizes will be awarded to the competitors who discover the greatest number of errors, in order of merit. First, Meccano Products value £2/2/–; Second, Products value £1/1/–; Third, Products value 10/6. Prizewinners will be notified by letter, and the result will be announced in due course in the Magazine.

In the event of a tie for any of the prizes the judges will take into consideration the neatness of the entries concerned.

All entries must be posted in time to reach Liverpool on or before the 31st October, 1936. Any received after that date will be disqualified.

"August" General Model-Building Competition

In this competition prizes are offered for models of any kind whatever built entirely from Meccano parts. All a competitor has to do is to think of some new and original subject and then set to work to build it in Meccano as neatly as possible. Any number of parts may be used, but all models submitted must be the competitor's own handiwork both in design and construction.

The competition will be divided into two Sections as follows: Section A, for readers of all ages living in the British Isles; Section B, for readers of all ages living Overseas. The age of each competitor will be taken into consideration when judging.

When the model is completed a photograph or a good drawing of it should be sent to "August General Model-Building Contest," Meccano Ltd., Binns Road, Liverpool 13. Photographs or drawings need not be the competitor's own work, but the model must be built by the competitor himself, without assistance from anyone. More than one model may be submitted, but no competitor may win more than one prize. If two or more models are submitted by one entrant they will be considered jointly. The competitor's age, name and address, and letter A or B indicating the Section for which the entry is eligible, and the name of the competition must be written clearly on the back of each photograph or drawing submitted. It should be clearly understood that actual models must not be submitted for consideration.

Prizes will be awarded in each Section of the competition as follows: First, Meccano Products value £3/3/–; Second, Products value £2/2/–; Third, Products value £1/1/–. There will be also Five Prizes of Products value 10/6, and Five Prizes of Products value 5/–, in each Section.

Readers living in the British Isles must forward their entries so that they reach Liverpool not later than 30th September, 1936. In order to give Overseas readers plenty of time in which to build their models the closing date for Section B has been extended to 30th November, 1936.

All prize-winners will be notified by post as soon after the closing dates as possible, and the full lists of awards, together with illustrations and descriptions of prize-winning models, will be published in due course in the *"M.M."* Prizewinners will have the opportunity of choosing any items they like from current price lists. Models that already appear in any of the Meccano publications are not eligible for entry in this contest.

Photographs or drawings of prize-winning models become the property of Meccano Ltd., but unsuccessful entries will be returned if a stamped addressed envelope is enclosed for that purpose.

Model-Building Competition Results

By Frank Hornby

"Ingenuity" and "Meccano—Dinky Toys" Contests

"Ingenuity" Contest (Home Section)

The principal prizewinners in the Home Section of the March "Ingenuity" Contest are as follows:

1ST PRIZE, Products value £3/3/–: F. R. Hilton, Cowes, I. O. Wight; 2ND, Products value £2/2/–: J. Maguire, Belfast; 3RD, Products value £1/1/–, P. Hands, Hillingdon.

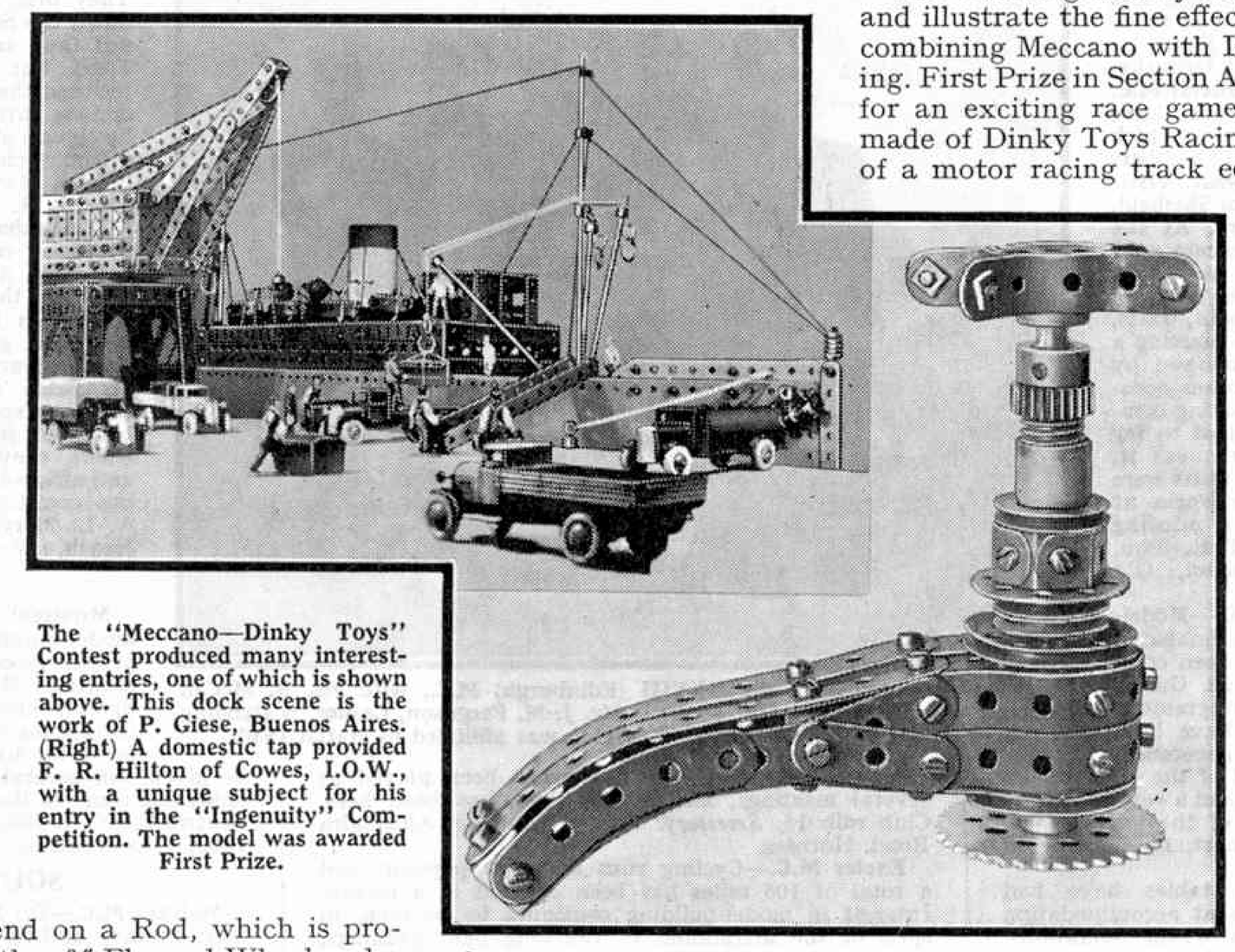
F. R. Hilton owed his success mainly to the simplicity and realism of his model of an ordinary household water tap, which is illustrated on this page. The nozzle of the tap is made from Curved Strips and 4½" Strips bent into the required shape. The bent Strips that form the base of the tap are secured to 1½" Pulley Wheels with the aid of ½" × ½" Angle Brackets. A Rod is pushed through the boss of the 1½" Pulleys, and on it are carried two 1" loose Pulleys, a Bush Wheel, a hexagonal prism made from Obtuse Angle Brackets, another 1" loose Pulley and a Chimney Adaptor, a Worm, a ¾" Pinion fitted with a Socket Coupling, and finally a built-up handle. The Worm is pushed inside the Chimney Adaptor and represents the screw thread usually found at the top of taps of this type. The handle is made of four 2½" Strips with their centre portions bent round the Socket Coupling, and their ends secured together by means of bolts. The tap is mounted on a 2" Sprocket.

The Second Prize was awarded to J. Maguire, whose model of a microscope attracted favourable attention by reason of its realism, and the fact that it is built with very few parts.

The stand is made from Curved Strips and is held in place on the base plate by Trunnions. The microscope itself consists of two Sleeve Pieces mounted end to end on a Rod, which is provided at its upper end with a ¾" Flanged Wheel and a Chimney Adaptor and at its lower end with a ¾" Flanged Wheel and a Collar. It is held in place on the upper end of the stand by means of Double Brackets and two Flat Trunnions. The specimen holder consists of a 2½" Flat Girder fixed in place by Strips and underneath it is a ½" Pulley Wheel that represents the mirror. The ½" Pulley Wheel is mounted between the prongs of a small Fork Piece secured to the base of the stand by a Double Bracket.

A little model of an electric fire was constructed by P. Hands. It consists essentially of two end frames made from half circles of 2½" Curved Strips, which are joined together by 5½" Strips. The reflector is made from two 3½" × 5½" Flat Plates overlapped by four holes and bent to the same curvature as the end frames. The heating element is a Rod provided with a number of Couplings and clamped at each end between two 1½" Strips that are bolted to the end frames. The end holes of the 1½" Strips are connected in pairs by means of Rods that represent the guard bars used in actual electric fires. The legs of the model are composed of Strips.

Other models of interest among the winners of the smaller prizes are a telephone receiver, which was built by J. Dinwoodie, a silver cup by R. H. Thorpe, a hearth companion set by P. Bunce, and a small traction engine by S. Girling. R. K. Martin selected a household water tap for his subject and although this is somewhat similar to the model that won First Prize it is not nearly so neat or ingeniously constructed as the latter model.



The "Meccano—Dinky Toys" Contest produced many interesting entries, one of which is shown above. This dock scene is the work of P. Giese, Buenos Aires. (Right) A domestic tap provided F. R. Hilton of Cowes, I.O.W., with a unique subject for his entry in the "Ingenuity" Competition. The model was awarded First Prize.

"Meccano—Dinky Toys" Contest

The "Meccano—Dinky Toys" Competition was announced in the February 1936 issue of the "*M.M.*," and readers were asked to submit models of any kind incorporating standard Meccano parts and any of the Dinky Toys. The entries received are of outstanding interest, and a selection of them is described below. The lists of the principal awards in the Home and Overseas Sections of the competition are as follows:

Section A (Home competitors of all ages)

1ST PRIZE, Products value £3/3/–: A. Aikman, W. Worthing, Sussex; 2ND, Products value £2/2/–: Miss L. Slater, Portsmouth; 3RD, Products value £1/1/–: A. Smith, Inverurie, Aberdeenshire.

Section B (Overseas competitors of all ages)

1ST PRIZE, Products value £3/3/–: L. Linder, Stockholm, Sweden; 2ND, Products value £2/2/–: L. Edwards, North Auckland, N. Zealand; 3RD, Products value £1/1/–: E. Azzopardi, Sliema, Malta.

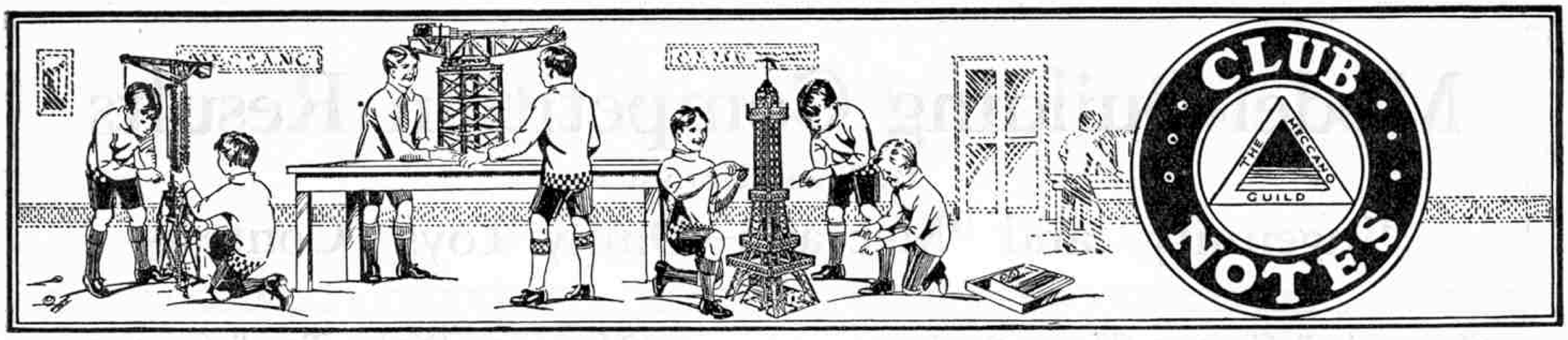
The entries generally were of outstanding interest, and illustrate the fine effects that can be obtained by combining Meccano with Dinky Toys in model-building. First Prize in Section A was awarded to A. Aikman for an exciting race game in which excellent use is made of Dinky Toys Racing Cars. The model consists of a motor racing track equipped with a number of Racing Cars, the track being 4 ft. 2 in. in length and 2 ft. 2 in. wide. The surface of the track is made of cardboard and is banked. It is provided with five slots that run completely round the track. Beneath the cardboard a number of Sprocket Wheels are fitted at equal distances along each of the slots, and on them run lengths of Sprocket Chain. The Chains are driven by means of an E6 Electric Motor and are held in correct tension by jockey pulleys mounted on spring arms. Meccano Dinky Toys Racing Cars (Nos. 23a and 23b) are placed on the baseboard and are attached to the Chains by pieces of wire that pass through the slots, and as the Chains move the cars are caused to travel realistically round the track.

A realistic dock scene forms the subject of the entry submitted by Miss L. Slater, and it includes a warehouse made from Flat Plates and Strip Plates bolted to a framework of Angle Girders, a wharf and a baseboard painted to represent water. Various Dinky Toys Motor Vehicles are placed in suitable positions on the quay and figures from the Station Staff Set are used to represent ships' officers.

A model entitled "Joyride" was submitted by A. Smith, and won Third Prize. It has a baseboard with two slots in which run endless lengths of Sprocket Chain driven by a Clockwork Motor fixed underneath. Dinky Toys Motor Cars are attached to the Chains that draw the cars too and fro across the board.

With the exception of those that won the principal prizes the entries in the Overseas Section, while quite interesting, generally are below the standard of those submitted for the Home Section. By far the best effort is L. Linder's model of a canal, complete with a lock and a Dinky Toys ship. The lock gates are made to open by means of a handwheel operated from the canal bank, and the ship slides along a platform that represents the surface of the water. It is hauled by an endless belt that is operated from a hand winding gear.

The dock scene illustrated on this page is the work of P. Giese, and is particularly interesting because of the skilful way in which Dinky Toys have been incorporated in it.



Pennthorpe School (Chislehurst) M.C.—An excellent model of the Meccano Motor Chassis has been completed. The keenness of the members ensured the success of the club's first Exhibition, to which added interest was given by the inclusion of a large model Transporter Bridge on loan from Headquarters. Several excellent Lantern Lectures have been given, including one by Mr. S. G. Braby, Headmaster of the school, on "*Locomotive Construction.*" Another Lecture described "*Eastern Canada,*" and was illustrated by slides kindly lent by the Canadian National Railways. Club roll: 27. *Secretary:* J. G. Slater, Sunny House, Clarence Road, Bickley, Kent.

St. James' (Grimsby) M.C.—A model ship-unloader, based on the Meccano Super Model, but provided with a special gear-box devised by the members provided good fun when put into operation. Models of a naval quick-firing gun and a derricking crane also have been completed. A Visit has been paid to the Grimsby Telephone Exchange. There is much enthusiasm for stamp collecting, and many exchanges of stamps are being made between members. Club roll: 5. *Secretary:* A. N. Dixon, 65, Yarborough Road, Grimsby.

Mary Swanwick School (Chesterfield) M.C.—Outings during the past club year have included a week's holiday at Tenby, which was so greatly enjoyed that many members asked for it to be repeated this year. Visits have been paid to Messrs. Firth's of Sheffield, and to Messrs. Pearson's Pottery. At the close of the Pottery tour Mr. Pearson very kindly showed the party his workshop, where they were delighted to see a model electric railway, complete with docks, boats, and even a lifting bridge. At one meeting a Tea was held, the meal being followed by games and competitions. On another occasion an amusing feature was a cooking competition, in which each entrant had to fry his own egg and bacon and then eat it. During the second winter session visits were paid to the L.M.S. Locomotive works at Derby, a local foundry and to a printing works. Club roll: 18. *Leader:* Mr. T. E. John, "Mary Swanwick" Modern School, Old Whittington, Chesterfield.

St. Oswald's (Norbury) M.C.—Model-building has been continued with unabated enthusiasm, and 46 models have been completed in one month. Occasional Games Evenings give variety to the programme, and several summer excursions have been arranged. A local gentleman has generously placed his garage at the disposal of the club for use as a club-room. The football team had a very successful season, and finished at the top of the local league. Club roll: 15. *Secretary:* R. H. Smart, 14, Kensington Avenue, Thornton Heath.

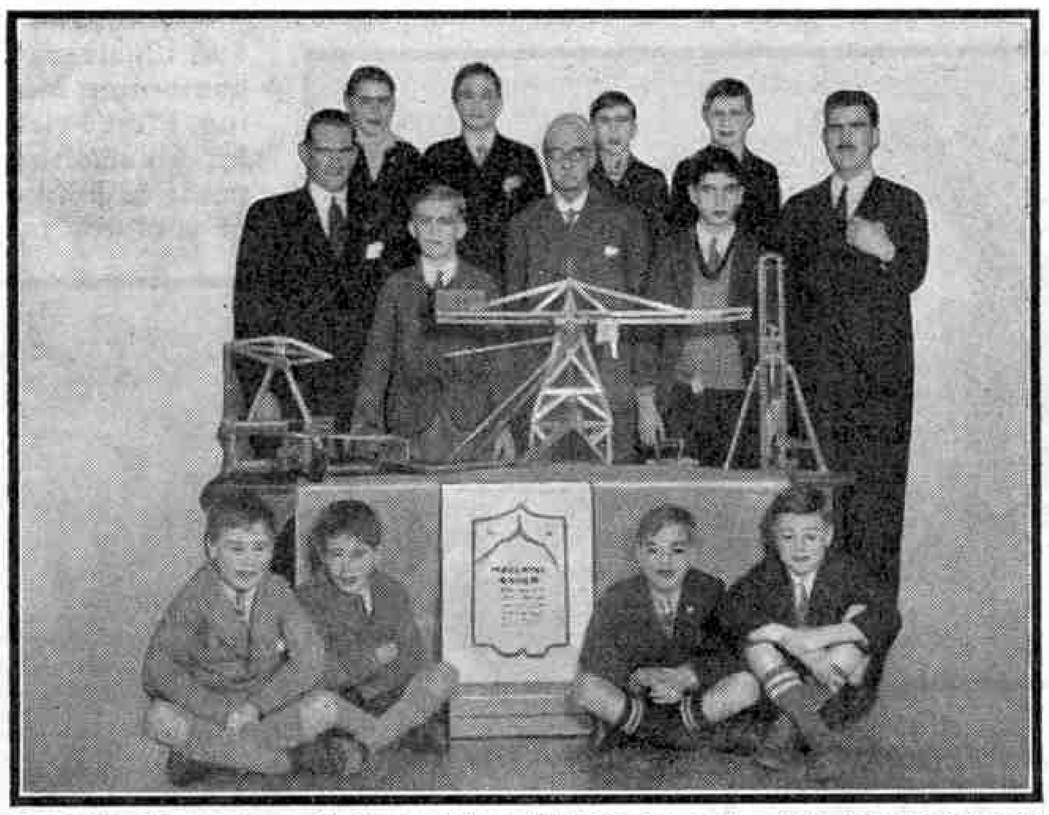
Fraserburgh M.C.—Additional tables have had to be acquired to provide sufficient accommodation for model-building and Hornby Train operations. A complicated railway layout has been planned in which three stations will be used, one being situated in the garden. It is intended to make the layout large enough for all the L.M.S.R. and L.N.E.R. engines available to be used simultaneously. One Saturday each month is now devoted to cycling, but the club room is open for members who do not wish to take part in the outings. Club roll: 28. *Secretary:* W. H. Dawson, Phingask, Fraserburgh.

Sid Vale M.C.—Members have been busy building Motor Show models and stands on which to display them. The Show was open to the public, and attracted many interested visitors. The vehicles on view included buses, vans, lorries and sports and streamlined cars. Club roll: 20. *Secretary:* L. R. J. Gliddon, Sheffield House, Sidmouth.

Old Charlton M.C.—A Talk on motor cycles proved very interesting, and a Debate on "*Steam Traction v. Electric on Railways*" brought forth some very good arguments for both sides, ending with a vote in favour of steam. An impromptu talks meeting, at which the subjects were written by the Leader on slips of paper drawn from a hat by the members, proved so amusing and interesting that other similar meetings are to be held. Each speaker was given two minutes in which to discuss the subject stated on his slip. An excellent Exhibition has been held, when an attractive display of models was staged. At one meeting four members who are in employment gave interesting 15-min. talks about their work. Club roll: 26. *Secretary:* W. Jaques, 60, Gurdon Road, Charlton, London, S.E.7.

Mall School M.C.—Several Meetings have been devoted to outdoor activities, and these have included a treasure hunt, which was much enjoyed. A mock trial has been held, and resulted in the prisoner being acquitted. Club roll: 32. *Secretary:* D. Rubin, Mendip Lodge, 33, Clifden Road, Twickenham.

Hornsea M.C.—An enjoyable visit has been paid to the locomotive sheds at Dairycoates, where Assistant Superintendent Swan permitted the members to enjoy the thrill of a ride on the footplate of an engine. The senior engineers recently visited the local gas works, where they were shown round by the Leader. Each member of the party received a rough plan of the works, and the features indicated on it were fully explained during the tour. One member, who has had the good fortune to visit Belgium and Holland, gave a very interesting Lecture on his trip and illustrated it by means of lantern slides and a film. The Leader gave a Lecture on "*Photography,*" in the course of which he showed his audience how to take indoor photographs. Mah Jong has been played at several meetings, and a film show has been held. Club roll: 15. *Secretary:* Mr. P. Thom, 5, Alexandra Road, Hornsea.



A group of members of the XXVIII (Edinburgh) M.C., with Mr. B. McCall Barbour, the President, in the centre. Mr. J. M. Ferguson, Leader, is standing at the right end of the group. This club was affiliated in March 1930.

Exeter M.C.—Cycling runs are very popular, and a total of 105 miles has been covered in a month. Interest in model-building continues to be keen, in spite of the attractions of the long light evenings, and models completed recently have included a large version of the liner "*Queen Mary,*" a railway station, ship, crane and an aerodrome. A Radio Circle has been formed, and the members of this will specialise in building various kinds of wireless sets. Work has already begun on the construction of a one-valve set. Club roll: 44. *Secretary:* K. Milton, 18, Baker Street, Heavitree, Exeter.

Islington M.C.—Owing to the great popularity of Lectures, they continue to form an attractive feature of this club's programme. Subjects dealt with recently have included the "*Post Office Railway,*" "*The Cutting of the Panama Canal,*" "*The Railway System at York*" and "*Britain's Largest Railway.*" Other activities have been model-building, fretwork, model aeroplane construction, chemistry and games. Club roll: 14. *Secretary:* K. Dines, 70, Mornhill Road, Islington, London, N.1.

Plymouth M.C.—The time of meeting has been changed from Saturday afternoon to Saturday evening. The club has also been re-organised and is now divided into three sections devoted to Meccano, Hornby and general activities respectively. The last named section includes the woodworking and printing branches of the club. It has been decided to acquire a new rotary type printing press that will print pages double the size of those accommodated by the present machine. Club roll: 68. *Secretary:* R. G. Symons, 47, Lisson Grove, Mutley, Plymouth.

Todmorden Road Central School (Burnley) M.C.—A debate on "*Hornby* or *Meccano?*" ended in favour of Meccano, by one vote. The Hornby section is making good progress, and becoming quite expert in railway operations. It is hoped to arrange for visits to the local Bus depot and the Rosegrove (L.M.S.R.) locomotive shed. Club roll: 28. *Secretary:* L. Hinton, 4, Thirlmere Avenue, Butland Avenue, Burnley.

St. Stephens (Saltash) M.C.—Games are very popular and are played for 50 min. at each meeting. Table tennis has been played with the local Y.M.C.A., who won by three games to two. The construction of the model of Millbay (G.W.R.) terminus is proceeding satisfactorily. Some enjoyable cycling runs and rambles have been held. An account of the activities of the club is to be published at the end of each month in the "*Saltash Gazette.*" Club roll: 15. *Secretary:* B. Braund, 9, Homer Park, Saltash.

Enfield Grammar School M.C.—The club participated in a school excursion to Southampton, where a tour of the Cunard White Star liner "*Aquitania*" was immensely enjoyed. After lunch on shore the party visited the great floating dock, the working of which was explained to them. They then had a trip on a paddle steamer down the Solent to Calshot, and during the sail they saw several R.A.F. flying boats. Tired but happy, the party eventually boarded the train for home, and had a last-minute thrill when the train was detained by signals at a point that gave everybody a splendid close view of the famous R.M.S. "*Queen Mary*" in dock. Club roll: 34. *Secretary:* J. H. Pettifer, 31, Goat Lane, Enfield.

Wednesbury M.C.—Model-building and Fretwork continue to be the chief indoor activities. A cabinet is to be made in which to store the club stock of Meccano, etc. A lantern lecture on "*Imperial Airways*" has been given by a senior member. On a recent Surprise Evening a member brought his Table Tennis outfit, and a very jolly time was spent with it. Several of the members took part in a Cycle Run to Lichfield, where they inspected the fine cathedral and afterward made a tour of the surrounding countryside. Club roll: 24. *Secretary:* A. L. Morgan, 17, Cobden Street, Fallings Heath, Wednesbury.

CANADA

Montreal Y.M.C.A. M.C.—Considerable model-building activity has centred round preparations for the club's display at the Montreal Boys' and Girls' Hobbies Show. Special models have been built for club demonstration purposes, and an improvised projector has enabled Lantern Lectures to be given. On several occasions members have spent enjoyable times in the excellent swimming pool at the Central Y.M.C.A. Club roll: 9. *Leader:* Mr. J. Rodriguez, 1900, Tupper Street, Apt. 4, Montreal P.Q. Canada.

SOUTH AFRICA

Malvern M.C.—On Magazine night members showed their literary ability in articles on various subjects, some of which were humorous in character. The Leader expressed his pleasure at the high quality of the contributions, and the next Magazine night is eagerly awaited. A hiking expedition to Bedford View by 12 members was much enjoyed. During the outing the party visited an important dairy, where they took snapshots of the work carried on. The many excellent models completed during a recent Bridge evening included road bridges, a footbridge with electric lights, a suspension bridge and a model of the Tower Bridge, London. Club roll: 85. *Secretary:* B. Saunders, P.O. Box 8, Cleveland, Johannesburg, S. Africa.

EGYPT

Zagazig M.C.—The club continues to make good progress, and meetings are held every week. A Lecture on "*What Industrial Chemistry Means*" has been given by the Leader. Another dealt with "*The Primary Materials of Perfumes,*" and was a prelude to much activity by members of the chemistry section, who have been busy experimenting in the preparation of perfumes. Club roll: 20. *Leader:* Mr. A. Mangourie, 39, B'Gannabiet Sikka Hadid Avenue, Zagazig, Egypt.

Club Not Yet Affiliated

Rangoon M.C.—Meetings are being held at the home of one of the members, and at one of the early meetings a helpful discussion was held on "*How to make the Club well known.*" Club roll: 6. *Secretary:* P. Swan, c/o Burma Dental Supply Co., 124, Sule Pagoda Road, Rangoon, India.

The Holiday Month

August is the great holiday month of the year, when many members are away at the seaside or in the country, and those who stay at home spend as much time as possible out of doors. Club room activities are restricted, and the programmes consist chiefly of games and excursions of all kinds. Whatever form these take, I hope that every member of every club is having a thoroughly good time.

In this country there is always the possibility of unfavourable weather to contend with, however. It is well, therefore, for Leaders to have ready some form of indoor entertainment that can be arranged quickly and easily in the event of rain causing an outdoor programme to be abandoned. In such circumstances indoor games are about the most satisfactory substitute, but an unexpected hour or so indoors also could be devoted to a series of two-minute talks by the members, or the reading of an excellent detective story, each member dealing with one chapter. A mock trial provides plenty of fun, but requires a certain amount of planning beforehand. If the members are "bursting" with energy a pleasant way of expending it indoors is in overhauling the club material and carrying out improvements in the club room so that it will be more comfortable and enjoyable to work in during the coming winter.

Making Club Reports Interesting

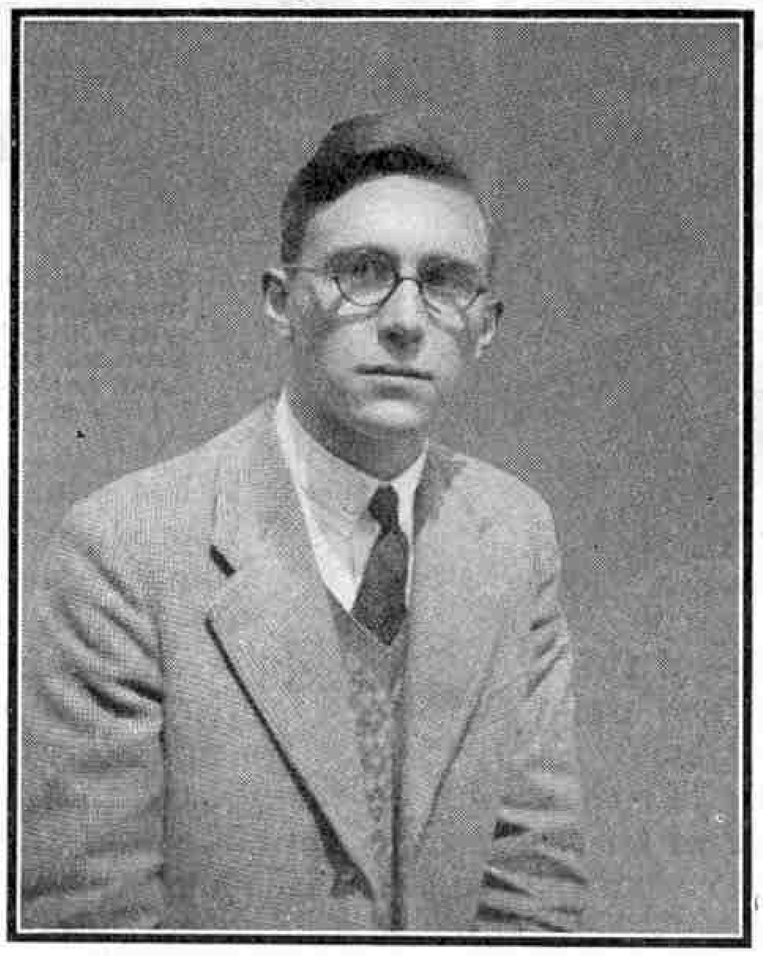
I am very pleased to say that there has been a good response to my appeal in the March *"M.M."* for more really interesting club reports. One result of this improvement is that I am now much better informed concerning the work and achievements of many clubs from which only scrappy notes on routine events used to reach me.

There are still a few secretaries who are content to remark that "the club continues to progress and the meetings are well attended," but I am sure that eventually they will come into line with the others. I am well aware that secretaries of Meccano Clubs are busy individuals, and that their duties are extremely varied in character. For this reason I suggest that any official who feels that he is unable to spare time to write adequate reports should delegate the duty to an assistant. This assistant could also act as minute secretary. He should take care to note down at each meeting the chief events of the evening, and he would then find it a very easy task to compile from his records a monthly report that does justice to the efforts of officials and members, and is sufficiently full and interesting to enable me to include an attractive notice in the "Club Notes" page.

It is important that secretaries should send me reports as regularly in the summer as in the winter, especially if a club is carrying out a programme that is keeping the interest of its members at a high level. Every year there are many young clubs making the experiment of keeping together throughout the summer for the first time, and they are greatly encouraged to persevere by reading accounts of successful summer sessions of other clubs, in addition to often gaining valuable hints for their own programmes.

Meccano Club Leaders

No. 84. Mr. K. A. Blackman



Mr. K. A. Blackman is Leader of the Pennthorpe School (Chislehurst) M.C., of which he was the founder. The club was affiliated as recently as February last, but has already held a very successful Exhibition.

Another New Lantern Lecture

I have received from the Publicity Manager of Imperial Airways Ltd., a copy of a lantern lecture entitled *"The Empire's Airway."* I am glad to recommend this fine lecture to Leaders of Meccano clubs, for it gives a fascinating account of the Empire air routes and of the elaborate organisation by which the services are carried on throughout the year. It is illustrated by 100 slides, many of which show the varied territory covered and the chief ports of call, while others give excellent views of the great air liners employed.

This lecture is contained in a special booklet *"The Empire's Airway,"* and a copy of this can be obtained on application to the Publicity Manager's Office, Imperial Airways, Airways House, Charles Street, Lower Regent Street, London, S.W.1, to whom application also should be made for the loan of the necessary slides. The lecture is certain to be very popular in view of the great interest that is taken in Imperial Airways' services and aircraft, and it is advisable to give at least three weeks' notice of the date of the lecture, so as to ensure that the slides will be available in time.

Secretaries in search of attractions for the winter sessions are reminded that a list of lectures that can be obtained on loan from various firms and railway companies is available, and I shall be pleased to send a copy to Leaders and secretaries who do not already possess one. The list not only indicates the nature of each lecture, but gives full information concerning the steps to be taken in order to obtain the slides and the accompanying descriptive matter. Usually application must be made well in advance, as in the case of Imperial Airways' lecture to which I have referred, and it is wise to have a copy of this list on hand when planning the forthcoming winter sessions.

Lone Members

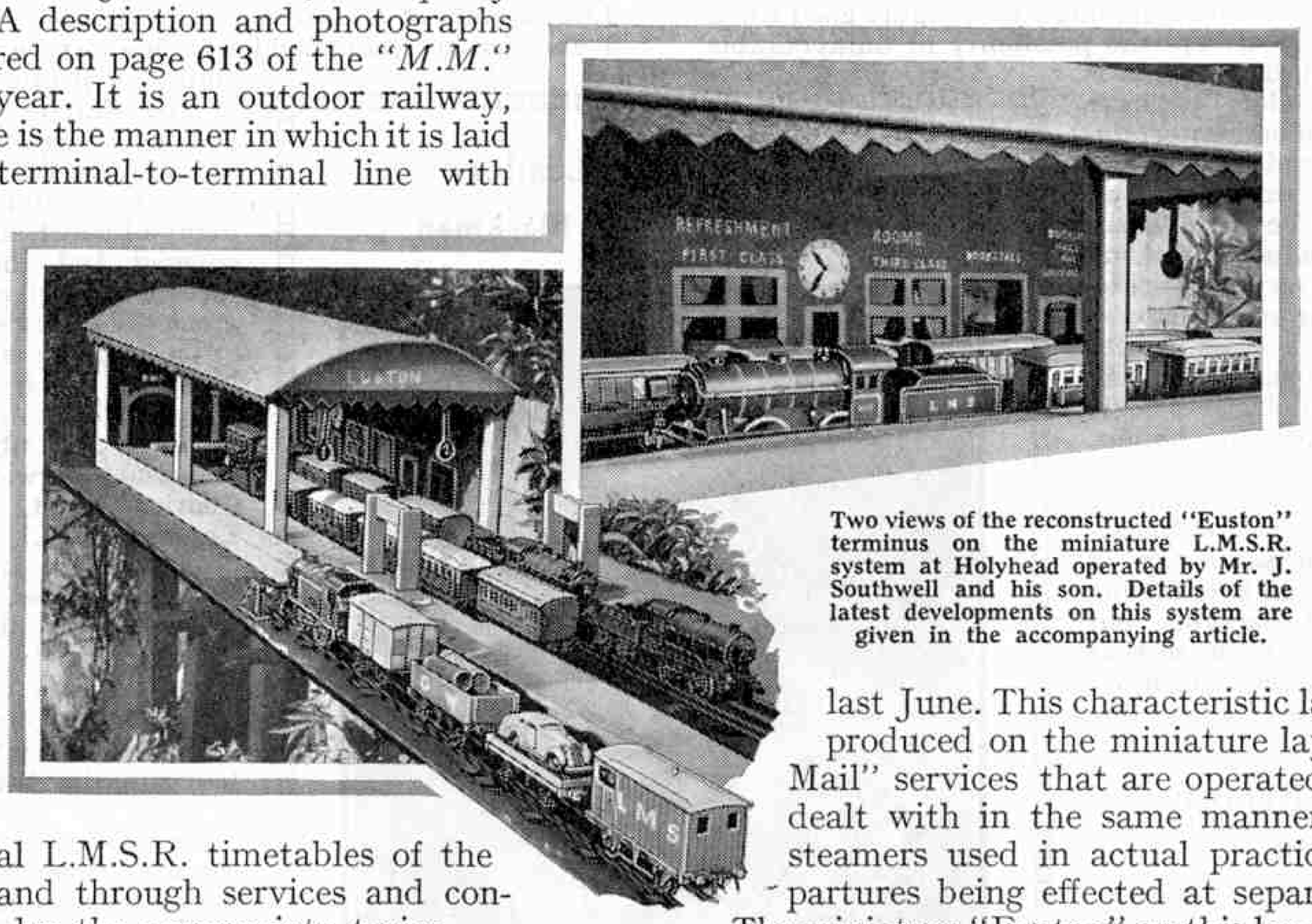
I have received several letters recently from boys living in remote places, who have written expressing regret that they are unable to join the Guild because there is no club in their vicinity. This idea is, of course, quite unfounded, for any boy who owns a Meccano Outfit or a Hornby Train Set may join the Guild, although he may live hundreds of miles away from the nearest Meccano Club, as is the case with many overseas members. These "lone members" are just as much members of the Guild as if they belonged to a Meccano Club, and they find compensation for their unavoidable isolation in correspondence with Headquarters and other enthusiasts who have joined the Guild Correspondence Club. Full details of this Club, together with entry forms, will be sent to every applicant.

Extending a Hornby Railway

Improvements on a Notable North Wales Layout

A REALISTIC feature of a miniature railway system is that there is always scope for some improvement, either in the layout, equipment or operations, even when it has reached a more or less complete state and boasts a regular service of trains. Additions are constantly being made in order to keep abreast of growing traffic, or to anticipate demands for more goods and passenger accommodation, and this accounts for many changes of great interest.

An excellent example of the development on these lines of a Hornby railway is given by the miniature L.M.S.R. system operated by W. Southwell, Holyhead, a keen H.R.C. member, and Mr. J. Southwell, his equally enthusiastic father. A description and photographs of the system appeared on page 613 of the "*M.M.*" for October of last year. It is an outdoor railway, and its special feature is the manner in which it is laid out as an actual terminal-to-terminal line with several branches. Remarkably complete services of passenger and freight trains are provided, and both "Winter" and "Summer" timetables are operated, the Summer services incorporating an increased number of trains in view of the demands of holiday traffic. The workings throughout are based on the real L.M.S.R. timetables of the routes represented, and through services and connections are worked by the appropriate trains.



Two views of the reconstructed "Euston" terminus on the miniature L.M.S.R. system at Holyhead operated by Mr. J. Southwell and his son. Details of the latest developments on this system are given in the accompanying article.

It will be recalled that on this miniature line the geography of the real L.M.S.R. system is modified for reasons of space, and "Shrewsbury" is brought into a position on the main line between "Stafford" and "Crewe." The most important traffic is the "Irish Mail" service between "Euston" and "Holyhead." "Stafford" is another through station on the main line, and branches serving separate terminal stations designated "Swansea," "Liverpool" and "Manchester" give very interesting "cross-country" workings.

A recent development has been the inclusion of a new terminal station representing Stoke. This can be reached direct from "Stafford" by trains going north, and direct from "Shrewsbury" by trains going south. The tracks from these two stations converge like the arms of a letter Y just before reaching "Stoke," and the platform line there occupies the position of the main stem of the Y. Trains can thus run into "Stoke" from the north and from the south, and if required they can stop there, but through journeys in both directions can be made by reversing. For working of this kind a fresh engine is backed on to the tail of the train on arrival in the station. This addition provides a new route that can usefully be employed when the through main line via "Stafford" is being occupied to capacity, as is frequently the case at the height of summer week-end traffic.

Improved facilities for freight traffic have been provided at "Stafford," "Shrewsbury" and "Crewe," and additional stations have been erected at "Craven Arms" on the Swansea branch, and north of Shrewsbury at "Whitchurch," where the "Manchester" line now diverges. The main terminals of the line, "Euston" and "Holyhead," also have received special attention. "Holyhead" has been modified and provided with an additional platform. This is arranged to join up the original platform at the landward end, and the two make a V-shaped formation with the railway lines along the outer sides, the space between the platforms representing the harbour. Ships and trains are accommodated on opposite sides of the quay at Holyhead, as described and illustrated on page 310 of the "*M.M.*" last June. This characteristic layout is now well reproduced on the miniature layout and the "Irish Mail" services that are operated regularly on it are dealt with in the same manner as the trains and steamers used in actual practice, arrivals and departures being effected at separate quays.

The miniature "Euston" on this layout has been entirely rebuilt, and the illustrations on this page show the effective appearance of the new terminus. This has two platform roads and separate goods accommodation, and an all-over roof covers the platforms and tracks. The platforms are more than six feet long, so that trains of exceptional length can be dealt with. The usual offices and buildings are provided, and the thoroughness with which the details have been planned and carried out is shown by the fact that the windows of the "Refreshment Rooms" are provided with miniature curtains! The whole station has been painted in the bright and effective fashion now commonly adopted in actual practice, and its appearance blends well with its garden surroundings.

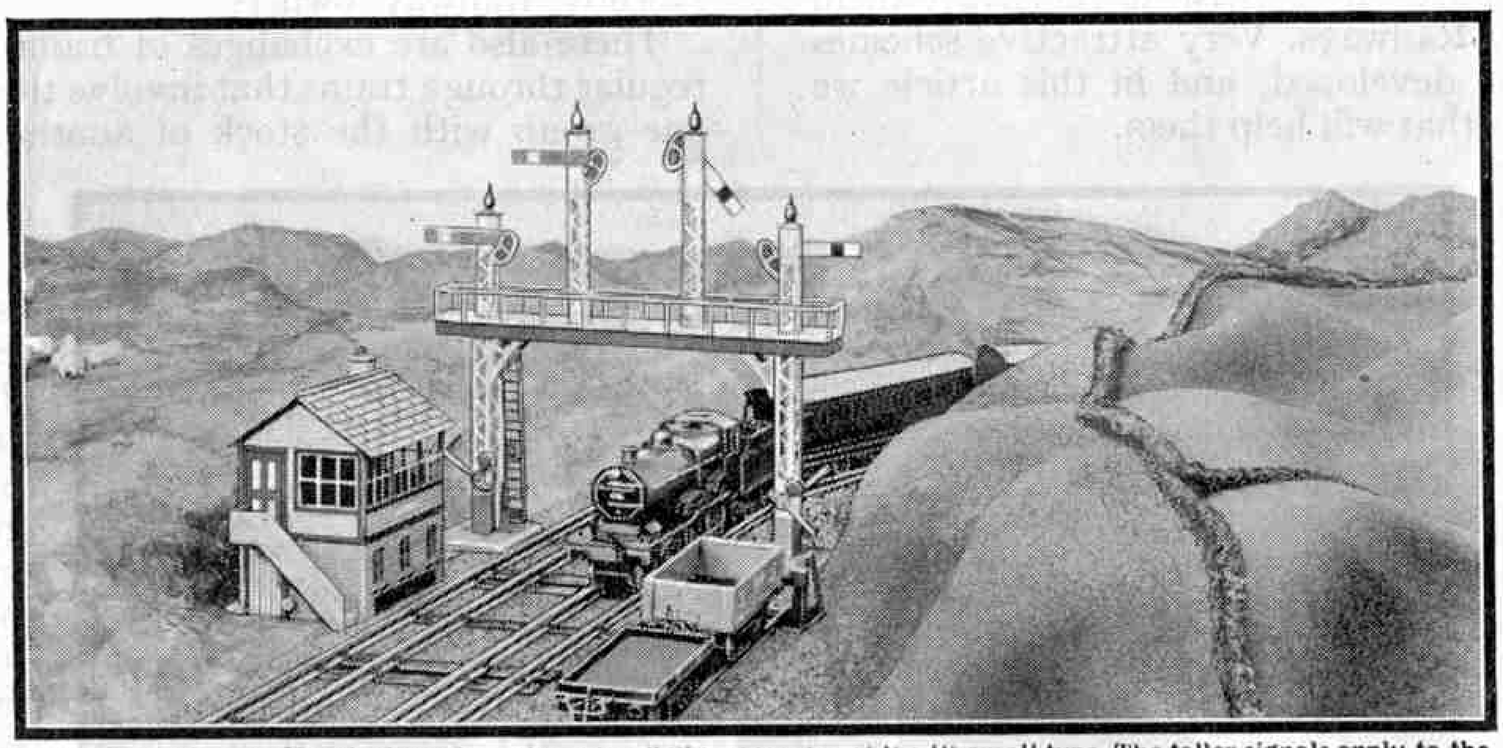
These improvements make it easier to handle traffic on the line, and one result of this has been an increase in the number of services operated. It has been necessary to put further stock into use in order to provide for this increase. A Hornby No. 1 Special Locomotive and Tender is the latest addition on the motive power side, and its capacity for work makes it a valuable member of the engine stud. In the rolling stock section there have been added four No. 1 Pullmans, and a No. 1 Passenger Coach and Guard's Van.

Hornby Signals and their Uses

By "Tommy Dodd"

WE have come to regard railway signals as the symbols of safety, and rightly so, for the almost perfect system of signalling that has been developed over the course of years has made British railways the safest in the world. There are no lives at stake on Hornby Railways, but signals are equally necessary on them, for they would not look at all realistic without miniatures of these familiar lineside features, which also are essential in order to enable traffic to be run in true railway fashion.

Each of the various types of signal in the Hornby Series is made in three different patterns, No. 1, No. 2, or No. 2E. The No. 1 Signals are the simplest and are quite realistic, although they lack some of the detail of those of the No. 2 type, which include a dummy lamp attached to the post and a ladder for the use of the "lampman." The semaphores of the No. 2 Signals also are of improved construction as compared with those of the No. 1 pattern, for they have transparent "spectacles" of the appropriate colours mounted in a frame of the correct type instead of solid tinprinted ones. The No. 2E kind are more elaborate, for they are fitted for electric lighting in addition to having the details standard on the No. 2 pattern.



A stopping train on a Hornby layout passing a No. 2 Signal Gantry of the "home" type. The taller signals apply to the main lines shown, and each of the shorter ones indicates that there is a divergence to the left a short distance ahead.

The arm or semaphore of the ordinary "home" signal has a plain square end, and when in its normal position must not on any account be passed by a driver. On the side that faces an approaching train the semaphore of this signal is painted red, and it has a plain vertical white stripe at a short distance from its outer end. At night a red light is displayed when the arm is in the "danger" position, and a green light tells a driver that the line is "clear."

In order to give due warning of the aspect displayed by the "home" signal, its indication is repeated by what is known as a "distant" signal, which is placed sufficiently far in advance of the "home" signal to allow a driver to pull up at the latter if this is necessary. A "distant" semaphore in the danger position is therefore a warning or caution indication.

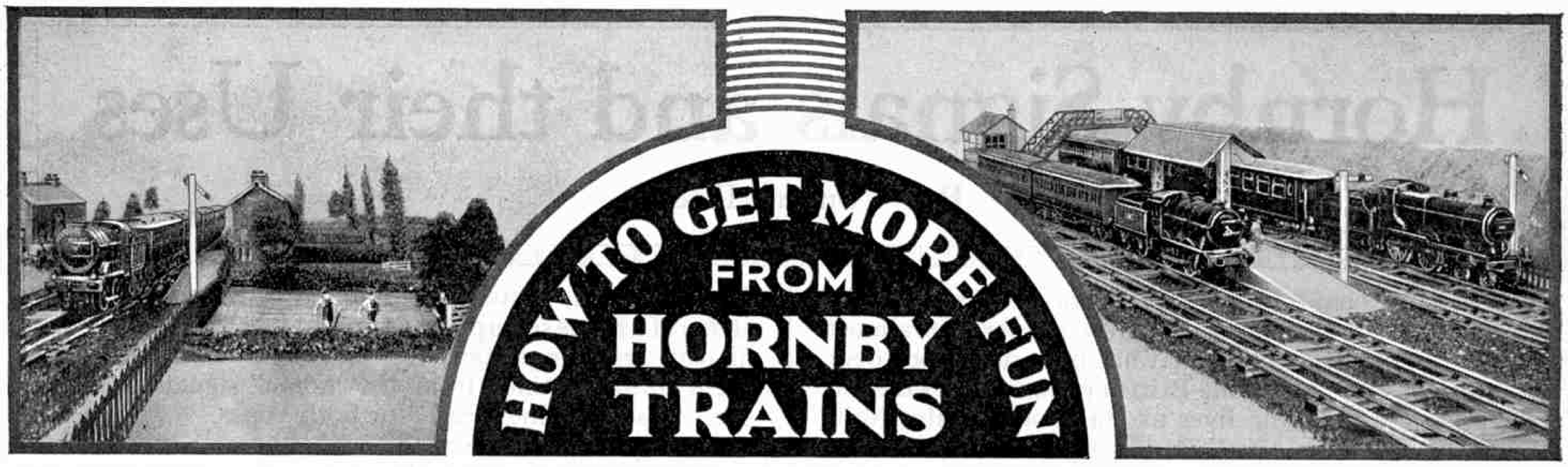
To enable "distant" signals to be recognised their semaphores have fishtailed notches cut in their outer ends. For many years this was the only distinction, and at night drivers had to rely on their knowledge of the route, for all signals showed red when in the danger position. In modern standard practice, however, the semaphore of a distant signal facing the train is painted yellow, with a black stripe following the contour of the fishtailed end, instead of the red with a plain white stripe of a home semaphore. At night "distant" signals now display an orange light for "caution," and this makes them quite distinct from the "home" signals. Green is used to show "line clear" for both types.

Hornby Signals are made with "home" or "distant" semaphores as required. The "distant" semaphores are correctly coloured yellow with the characteristic black stripe, and the electrically-lighted No. 2E Signals of this kind display the correct orange and green lights.

The Double-Arm Signal is an interesting type, carrying a "home" semaphore at the top of the post, with a "distant" arm below it. These signals are used in practice where the section ahead is so short that the distant signal applying to the next signal could not be placed in its correct position. It is therefore mounted on the same post as the preceding home semaphore. If the latter only shows "line clear" a stop is likely at the next "home" signal, but if both the semaphores show "line clear" the next "home" signal also will be in this position. The "distant" semaphore must never show "line clear" when the "home" arm on the same post is at "danger."

Divergences to the right or to the left are indicated by junction or "splitting" signals, one for each route. The signals at the junction or points are of the "home" type. Sometimes they are preceded by a single distant, although the junction signal itself has two semaphores, and on some routes complete "splitting" or junction distants are provided. Both "home" and "distant" Junction Signals are available in the Hornby Series, so that actual practice can be correctly followed by the Hornby Railway owner who specialises in signalling. An interesting point is that the No. 1 Junction Signal of the Hornby Series has the shorter post on the left-hand side, indicating that the less important or branch line diverges on that side, but the No. 2 and No. 2E Junction Signals have it on the right-hand side. Branches to the right or to the left thus can be correctly signalled.

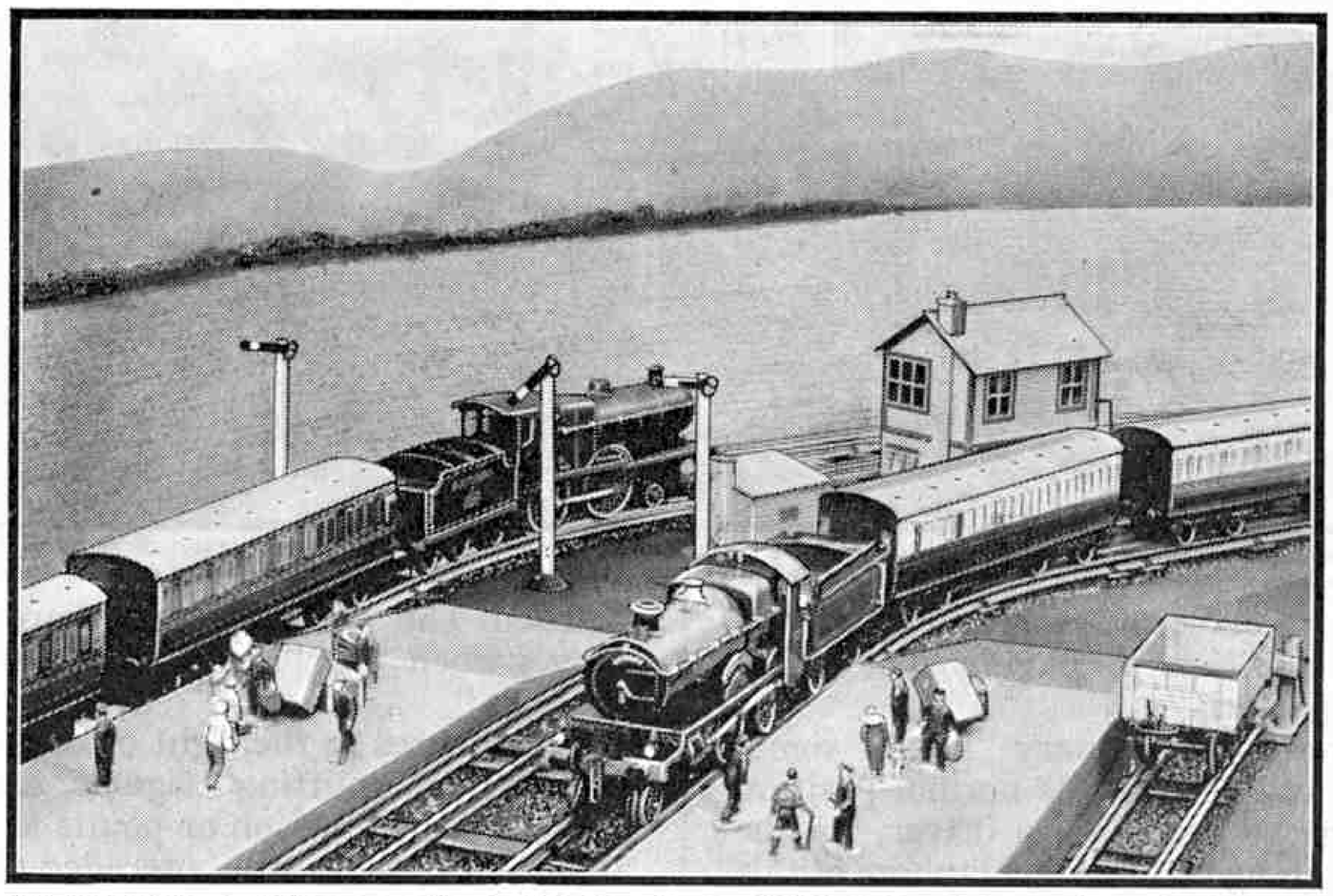
A signal gantry is practically a bridge on which several short signal posts are mounted, and is used where there are several lines or divergences to be signalled. The Hornby Signal Gantries have four signal posts mounted on the actual gantry portion. The tall posts for the more important lines are in the centre, those for the less important or diverging roads are on the outside.



SUMMER SERVICES ON HORNBY RAILWAYS

MOST readers will be enjoying themselves at the seaside or in the country when they obtain this month's issue of the "*M.M.*" On their holiday journeys by rail they will probably have seen various forms of special working and interesting train operations that are peculiar to the period of summer traffic, and are sure to wish to reproduce them on their own Hornby Railways. Very attractive schemes on these lines can be developed, and in this article we give a few suggestions that will help them.

During the summer there is a great deal of through working, not only of coaches but also of locomotives. Traffic is heavy and at times unusual locomotives, and possibly rolling stock, are used for certain duties. Through running now takes place between different sections of the same group, and also between the groups themselves, to a much greater extent than ever before. This is particularly so where trips are being run to some seaside or inland resort, possibly in connection with some special event, and there are numerous instances of such through working by "foreign" engines and stock on excursion trains.



Summer service operations on a Hornby S.R. layout. The G.W.R. train arriving at the station represents a through working of the kind frequently observed in actual practice.

A great deal of fun is to be had in miniature if similar schemes are followed on a Hornby Railway. This is easily possible where two or more H.R.C. members operate their engines and stock together on a layout arranged by combining their rails and other equipment to form one system, for the locomotives and vehicles of different companies are then invariably represented.

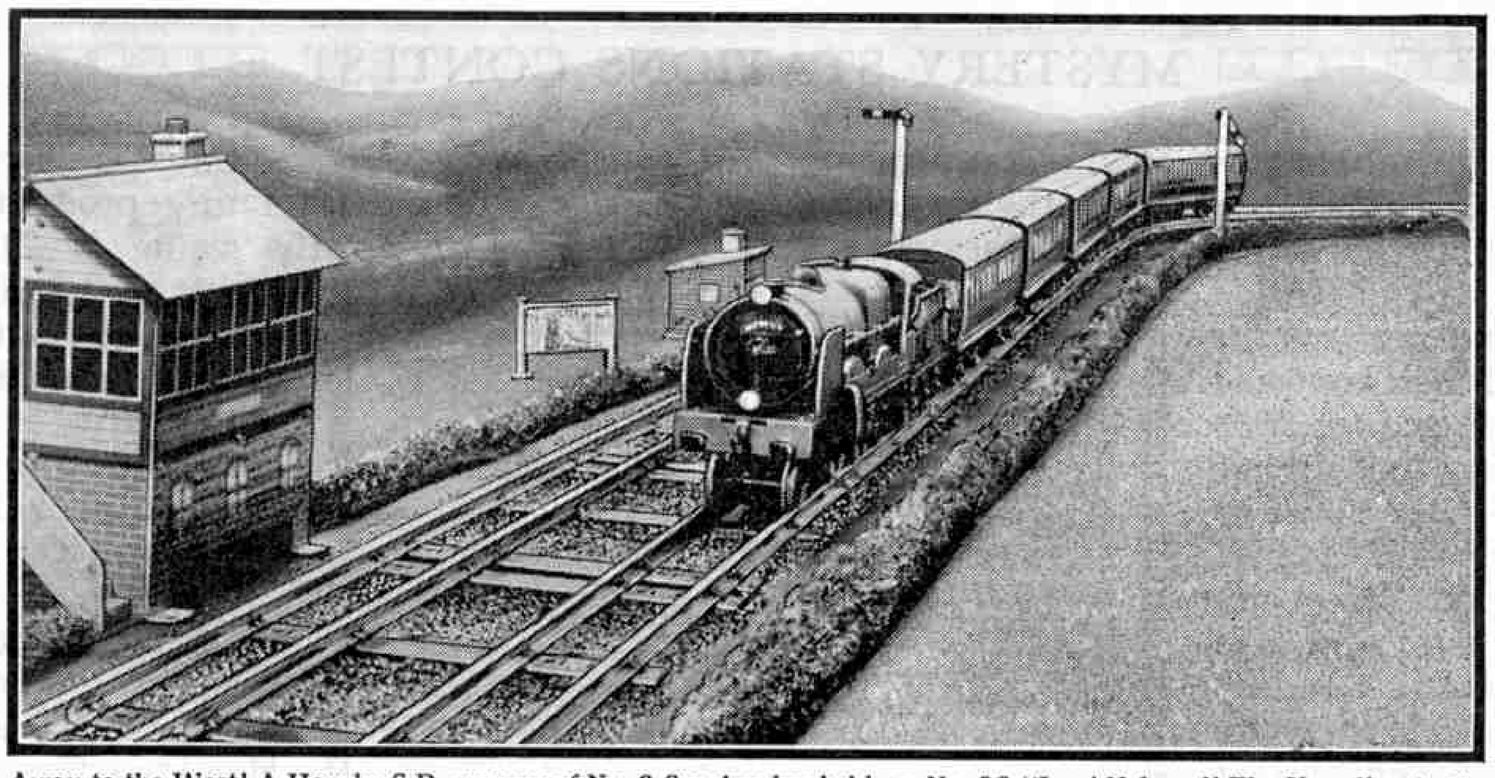
The exact services to be reproduced may vary according to the tastes and ideas of the operators. For instance, G.W.R. excursions are worked with that company's engines over the S.R. into Bournemouth. Similarly S.R. engines and vehicles return the compliment by working over G.W.R. metals in the West, particularly in connection with the "sight-seeing" excursions that are now so popular. A round trip may follow the route of one company on the outward journey, returning over the metals of the other. A "sight-seeing" excursion, bearing the special decorations on the engine that are always used nowadays for such purposes, would be an unusual train in miniature, and its working could be made very interesting by keen Hornby Railway owners.

There also are exchanges of traffic and the working of regular through trains that involve the use of the engines of one group with the stock of another. For example, the "*Sunny South Express*" consists of L.M.S.R. stock that is taken over by S.R. engines at Willesden Junction, and hauled to the South Coast. Such arrangements give attractive working in miniature, especially when the locomotives of different companies appear side by side. This is shown in the illustration on this page, in which a Hornby S.R. No. 2 Special Locomotive and a G.W.R. No. 2 Special Locomotive are seen at the same station, each with a train of appropriate rolling stock. The designs of the two engines are quite different, although both have the 4–4–0 wheel arrangement.

The summer season is essentially the time for organised outings and similar excursions, and in many instances special trains are chartered for the conveyance of parties. A development of modern times has been the complete tour or "land cruise," made by train, the journey occupying perhaps several days. The trains used are of special formation, according to requirements, and it usually is the custom to decorate or distinguish in some suitable manner the locomotives that haul them. A favourite form of decoration is a large circular board that can be mounted in front of the smoke-box, bearing on it details of the particular train.

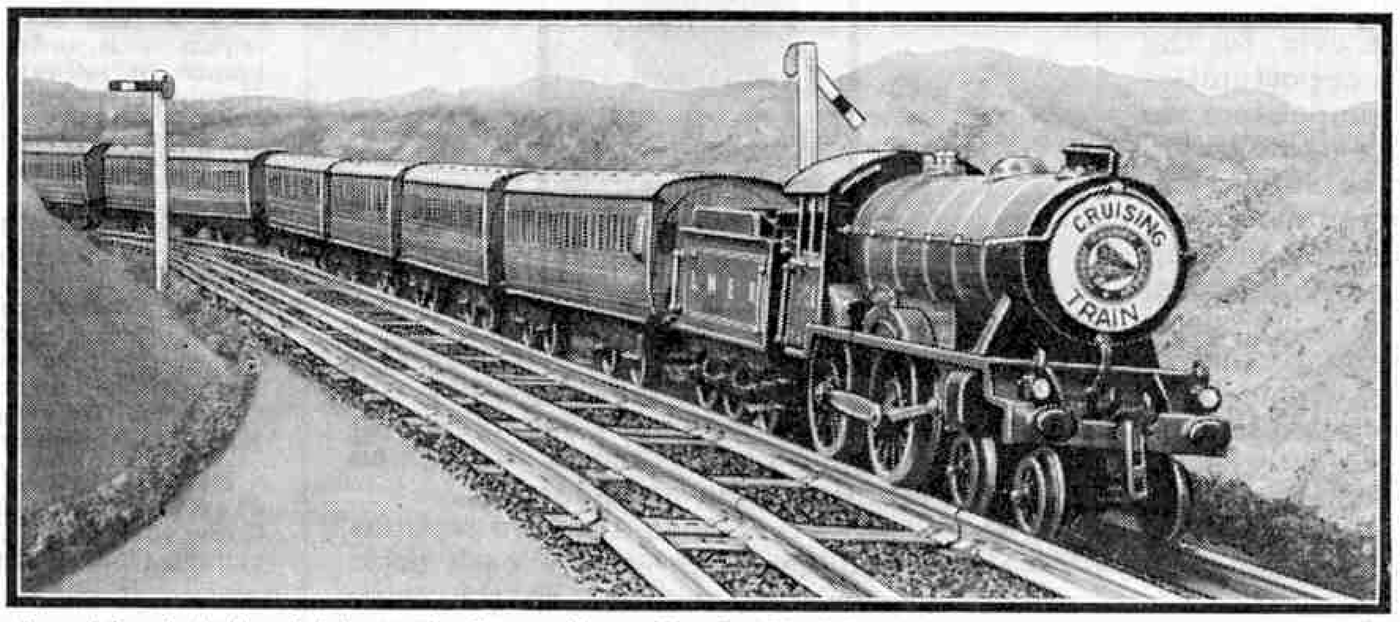
Additions of this kind are particularly attractive in miniature, and the lower photograph on the next page illustrates an interesting plan that could be followed on any Hornby layout for the decoration of the engine of a Hornby Railway Company "cruising" train or any other "special" of

this kind. The "board" shown is a circle of white card, $1\frac{1}{4}$ in. in diameter, with a reproduction of the familiar H.R.C. badge pasted in a prominent position in the centre. This badge can be taken from any publication in which it appears; and a disc cut from a plain postcard will be suitable for the "board" itself, which can be hung by a small loop of cotton from the top lamp bracket of the engine, or from the small hand-rail that on some designs of locomotive passes straight across the front of the smoke-box door. Other details are carried out in Indian ink. Hornby railway owners can easily make boards of their own design, incorporating more detail if necessary, and also some reference to the purpose and destination of the train. A board of this kind is easily changed when necessary.



Away to the West! A Hornby S.R. express of No. 2 Coaches hauled by a No. 3C "Lord Nelson." The Hoarding in the lineside field displays the slogan "It's Quicker By Rail."

A point of importance in connection with the running of special trains of this kind is that publicity arrangements should be made to draw the attention of the Dinky Toy "public" to the facilities offered. Suitable "bills" and posters can be prepared by keen miniature railway operators and displayed on the Poster Boards and Station Hoardings. Very pleasing results can be obtained with ink and paints, and it is frequently possible to make use of cuttings from real timetables and the holiday guide books and folders that are so numerous nowadays. The advantages of a particular route or the attractions of a certain district may be stressed, and the familiar phrase *"It's Quicker By Rail"* certainly should not be overlooked. The creation of a "Publicity Department" indeed increases the fun of miniature railway working, and the results of its efforts strike a topical note, and add considerably to the air of realism of the operations generally.



A cruising train in miniature. The locomotive, a Hornby No. 2 Special L.N.E.R., "The Bramham Moor," is decorated with an appropriate board, as described in this article.

There is a great demand for Pullman, buffet and restaurant cars during the summer season. Good use therefore can be made of Hornby Pullmans, which are typical of the luxurious stock operated on the L.N.E.R. and S.R. by the Pullman Car Co. Ltd. Buffet and restaurant cars of railway companies' stock can be represented by Hornby No. 2 Saloon Coaches. These vehicles in fact can be used extensively for holiday traffic, for they are of the centre-corridor type that is so popular in actual practice for the composition of long-distance excursion trains.

Another use to which No. 2 Saloon Coaches can be put is to represent sleeping cars, which are required in large numbers on the routes to Scotland, especially during August. The commencement of the grouse shooting season on 12th August causes a northward rush on the days, or rather the nights, immediately preceding the magic date, and several trains consisting perhaps of "sleepers" only are run in addition to the regular *"Royal Highlander"* from Euston and the *"Highlandman"* from King's Cross. The introduction of such "Twelfth" traffic in miniature will add to the enjoyment to be obtained from summer operations on a Hornby L.M.S.R. or L.N.E.R. system.

A scheme already suggested in these pages can be employed to make the standard Saloon Coaches look more like the actual sleeping cars. On one side of the coach a strip of tissue or thin white paper is placed between the metal side of the Coach and the strip of celluloid window "glass." This gives a realistic reproduction of the windows on the compartment sides of sleeping cars. The scheme is very effective and the appearance of a train of several Saloon Coaches so fitted is quite distinctive.

In addition to extra traffic of this kind, during summer there are lively "rushes" from the cities to seaside resorts, especially at weekends. As an instance, specially intensive services to the various Kentish Coast resorts are maintained by the S.R. Train after train actually becomes a "Kent Coast Express," and the work demands the best of the Eastern Section locomotives.

A very good representation of a typical Kent Coast train can be made up of Hornby No. 2 Coaches in S.R. colours. At its head can be placed the E220 Special tender Locomotive, or the corresponding No. 2 Special Clockwork engine, both in S.R. colours, for these are representative of the Ashford 4–4–0 type that for a long time has put up fine work on these duties. More recently bigger engines have been in common use over the Coast lines, however, so that a No. E320 or No. 3C Locomotive in S.R. colours can be used quite well, if preferred.

The working of through coaches to various destinations sometimes accounts for remarkable train formations, although at the height of the holiday traffic the number of passengers may require almost a separate train for each place normally served by a through coach.

H.R.C. COMPETITION PAGE

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

MYSTERY STATIONS CONTEST

As most H.R.C. members are on holiday during August, our competition this month takes the form of a word puzzle that will provide interest and amusement for them while they are at the seaside or in the country, and perhaps far away from books and their copies of past issues of the Magazine. It is based on station names that do not give any indication of the town or city in which they are found. Waterloo and Liverpool Street are typical examples of names of this kind. Both stations are in London, but the names by which they are known to every railway enthusiast give no direct clue to this fact.

MELSITERTE	**ROGNAPA**
SWENTRTEE	**PADMTELEMES**
ROSAQUTEFSRER	**RAWDESTLOWN**
DACLITE	**DANLORDOON**
SACLET	**RIPOYR**
EHTSCON	**GINLEWLONT**
SOWDODIE	**KAPTNBO**
LANGREE	**YAUKBNQA**
RYEWVEAL	**GONTANDIDP**
TIRVACIO	**GIKARKET**
FYARRI	**TSHNERRUFCTCEEH**

In the panel on this page are the names of 22 well known stations of this type, but in each case letters have been jumbled, and competitors are invited to discover the identity of these stations, and to state the town or city in which they are placed. The initials of the railway company owning each station now and before grouping took place in 1923 also must be given.

Prizes consisting of any products manufactured by Meccano Ltd. to the value of 21/–, 15/– and 10/6 respectively will be awarded to the senders of the three best entries. In the case of a tie for any prize, this will be divided equally between the successful competitors. Consolation prizes also will be awarded to the senders of the next best solutions.

Envelopes containing entries must be marked *"H.R.C. August Mystery Stations"* in the top left hand corner, and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st August. The closing date for competitors in the Overseas Section is 30th November.

Entries, which should be written out on postcards, must have on them the H.R.C. numbers of their senders, and those not distinguished in this manner will be disqualified.

Railway Photographic Contest

The summer series of Photographic Contests, which closes next month, has produced many remarkably good entries, some of which have already been published in the *"M.M."* This month we expect a larger number of entries than ever, for the holiday season gives ample opportunities for making use of cameras. Competitors are reminded that any railway photograph, either large or small, may be submitted. The exposure must have been made by the competitor himself, but development and printing may be the work of professional photographers.

This month's Contest will be divided as usual into two Sections, Home and Overseas. The prizes to be awarded in each will consist of products manufactured by Meccano Ltd., or if preferred photographic material, to the respective values of 21/–, 15/– and 10/6. A number of consolation prizes also will be awarded.

On the back of all entries submitted for this contest must be written a short description of the scene shown in the picture, the competitor's name, full address and his H.R.C. membership number.

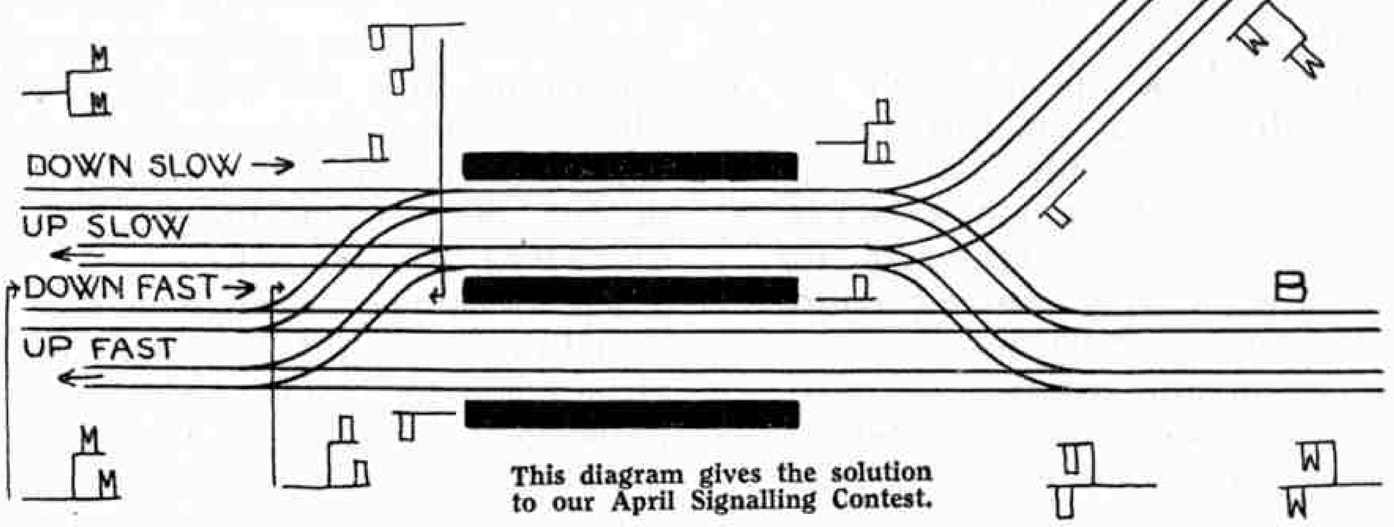
Envelopes containing entries must be marked *"H.R.C. August Photo Competition"* in the top left hand corner, and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st August. The latest date in the Overseas Section is 30th November.

Summer Puzzle Contest

The accompanying illustration is the second in our series of three Mystery

Photographs, the first of which appeared last month. The third puzzle picture will be given in our September issue, and in each case the object shown is a well known Hornby Train component.

The Contest is divided into two sections —Home and Overseas—and a cash prize of £1/1/– will be awarded to the competitor in each section who gives the best solutions to the three puzzles of the series. Full directions for sending in entries will be given in the September issue.



This diagram gives the solution to our April Signalling Contest.

COMPETITION SOLUTIONS

APRIL "SIGNALLING CONTEST"

A diagram giving the solution of the April "Signalling Contest" appears at the foot of the page. As there are many variations in railway signalling practice, the actual number of signals required was specified when this contest was announced. In spite of this, many competitors failed because they introduced signals that are unnecessary. The results generally show a high standard of knowledge of signalling requirements, and there is no doubt that this important branch of railway practice is well understood by Hornby Train enthusiasts.

COMPETITION RESULTS

HOME

June "Dream Journey" Contest.—First: J. C. Button (10335), Crewe, Ches. Second: K. Costain (5108), Bolton, Lancs. Third: J. Fraser (2267), Exeter. Consolation Prizes: M. L. Harper (8718), Wood Green, London, N.22; E. H. Frewin (25098), Oldbury, Nr. Birmingham; W. W. Pollard (45922), Datchet, Nr. Slough, Bucks.; E. R. Dudley (37680), Carshalton, Surrey; A. W. R. Coomber (8098), Bedford; K. L. Milburn (26029), Chingford, London, E.4.

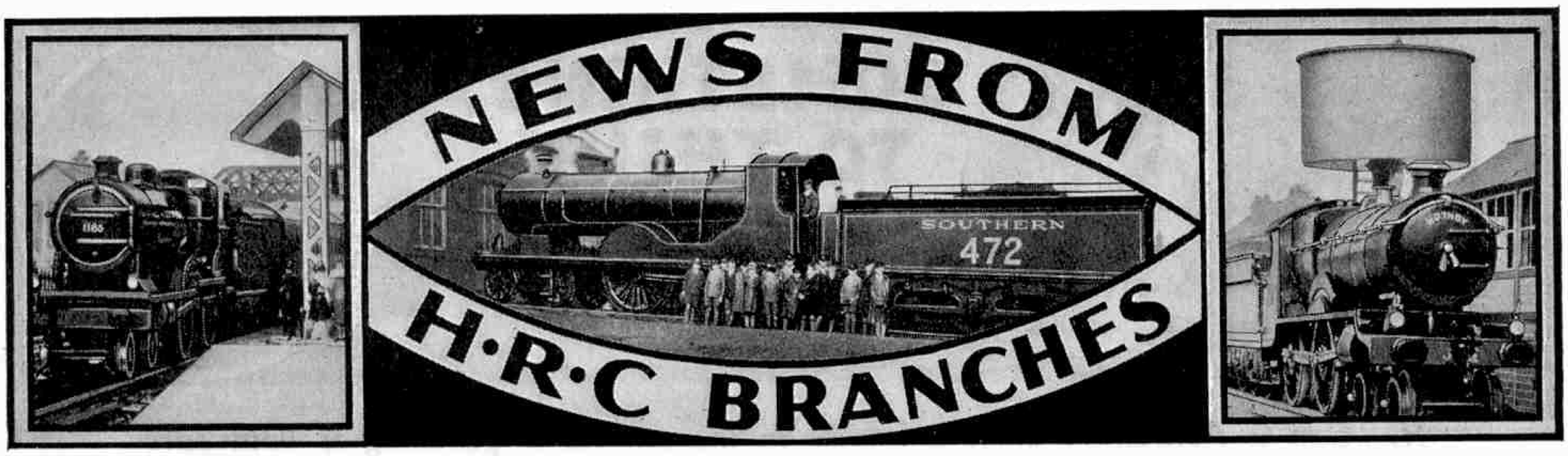
June "Railway Photographic Contest."—First: T. Fletcher (6057), Perry Barr, Birmingham. Second: C. Spencer (44179), Sheffield 11. Third: E. W. Oglethorpe (46851), Harrow, Middlesex.

OVERSEAS

March "Name and Number Contest No. 6."—First: I. Brough (9112), Preston, N.18, Victoria, Australia. Second: W. S. Eagle (31779), Byculla, Bombay, India. Third: G. Hallack (17578), Capetown, South Africa. Consolation Prizes: D. J. White (9333), St. Albans, Christchurch, N.1, New Zealand; H. C. Key (24764), Park Circus, Calcutta, India.

March "Railway Photographic Contest."—First: R. M. Perry, Park View, Johannesburg, South Africa. Second: Nils Söderberg (43551), Falun, Sweden. Third: G. E. Schulz (15425), Coromby, Victoria, Australia.

March "Drawing Contest."—First: M. Conly (24290), Dunedin, N.W.1, New Zealand. Second: Nils Söderberg (43551), Falun, Sweden. Third: E. C. Heath (29104), West Pennant Hills, New South Wales, Australia.



Branch News

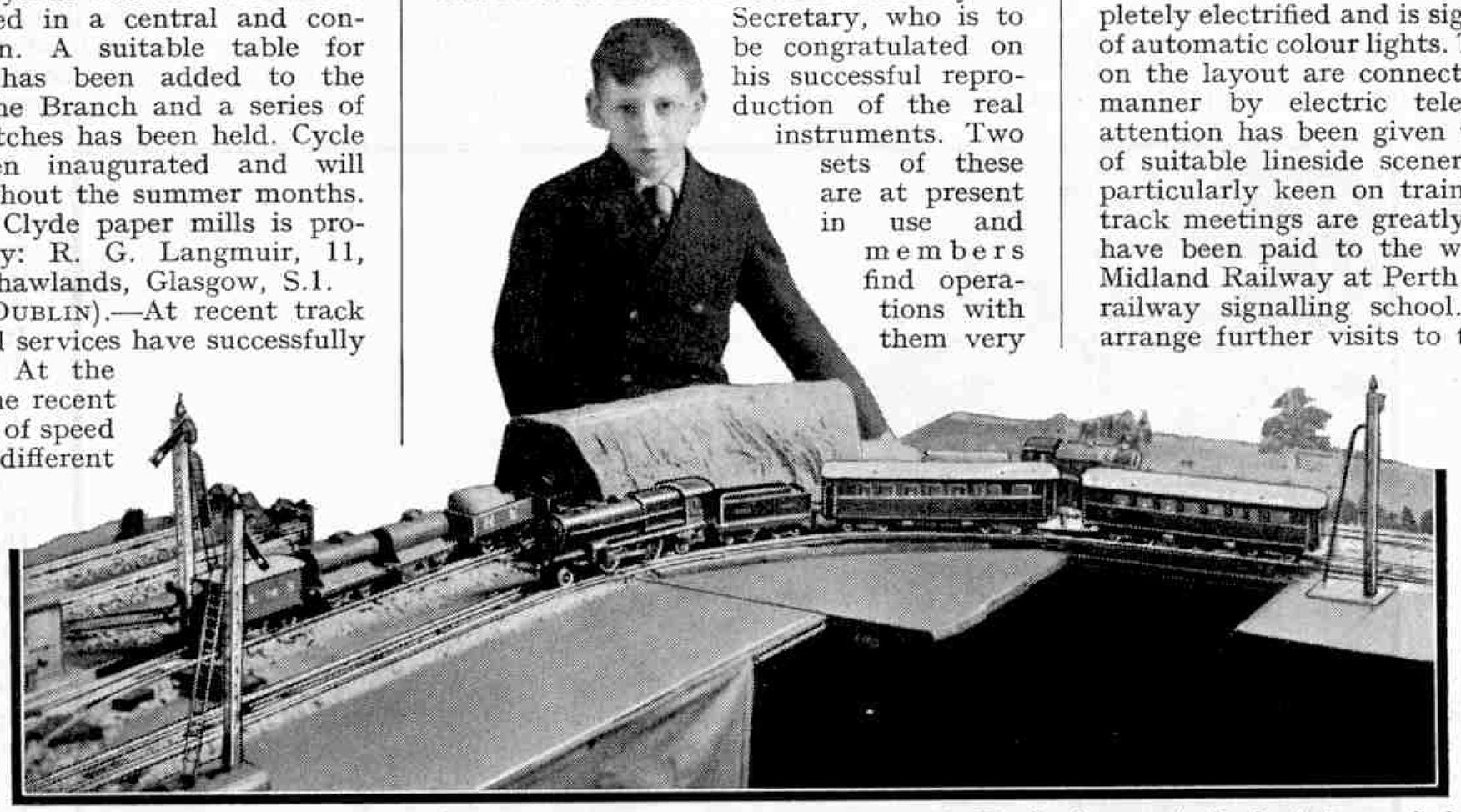
RUTHERGLEN (GLASGOW).—Several meetings have been devoted to the construction of a new layout. The track has now been completed and has been found generally satisfactory. It consists of an oval main line having a terminal station with four platforms. There are two goods stations and two goods yards and the locomotive depot is situated in a central and convenient position. A suitable table for indoor games has been added to the equipment of the Branch and a series of table-tennis matches has been held. Cycle runs have been inaugurated and will continue throughout the summer months. A visit to the Clyde paper mills is proposed. Secretary: R. G. Langmuir, 11, Afton Street, Shawlands, Glasgow, S.1.

WATERLOO (DUBLIN).—At recent track meetings normal services have successfully been operated. At the conclusion of one recent meeting a series of speed tests of several different locomotives was carried out. A visit has been paid to the Kingsbridge terminus of the Great Southern Railways and members followed with interest the working of various trains in and out. Several successful photographs were taken on this occasion. Secretary: Mr. S. B. Carse, 38, Oakley Road, Ranelagh, Dublin.

FOLKESTONE.—On the Hornby layout considerable attention is being given to the harbour works and other items of marine interest at "Folkestone." Good progress has been made with the construction of various ships to be used in conjunction with boat trains and other services. The flags flown by these vessels are to be painted to represent different companies. Cruises and other special services are to be arranged. A Meccano Outfit won by the Secretary of the Branch has been added to the Branch stock of Meccano parts and the construction of several improved models has been the result. Secretary: Mr. F. E. Saunders, 79, Dover Road, Folkestone.

FOREST ROAD CABIN (SOUTHPORT).—For the time being Branch members make use of the track belonging to the Secretary. This consists of a double track continuous main line with various sidings and loop lines. It is situated in a shed specially built for the purpose so that the maximum of scenic effect can be obtained. The interior of the shed is decorated with railway, shipping and airways posters, and is provided with special illumination that is very effective. Secretary: K. F. Pyett, 46, Forest Road, Southport.

ARDSLEY.—Train running is carried out in the orthodox manner by means of real signals and miniature block telegraph instruments. These were constructed by the Secretary, who is to be congratulated on his successful reproduction of the real instruments. Two sets of these are at present in use and members find operations with them very instructive. Secretary: G. Etherington, 3, Oxford Street, Ardsley, Barnsley.



Part of the Hornby railway layout operated by P. Lancaster of Hull (H.R.C. No. 22023). The line is conveniently situated on a raised baseboard, and is attractively arranged with ballasted tracks and suitable scenic and lineside details.

CHORLTON-CUM-HARDY.—A social meeting held at the Secretary's house was greatly enjoyed by the members. Track meetings have been run on the usual lines and various types of layouts have been tried, each proving very satisfactory. Various visits to places of interest are being arranged for the future. Secretary: G. H. Gill, 56, Highfield Road, Chorlton-cum-Hardy.

ELMSIDE (EXETER).—At meetings of Directors, special attention has been given to plans for improving working on track nights and as a result the general standard of train operations has improved to a considerable extent. A special display was given at a Fete arranged by a local church. The track laid down included 12 stations and members of the Branch attended in relays to work the trains. The display attracted much attention and added appreciably to the revenue. An interesting feature is that as a result of careful consideration of the services arranged for this display, means of improving the schedules at present in force on track nights have been discovered. Summer train services have been run at recent meetings, the number of heavily-loaded long-distance expresses being a feature. Secretary: T. W. A. Smith, 98, Ladysmith Road, Exeter.

OVERSEAS

PERTH (W.A.)—The Branch layout now consists of 540 ft. of track. This is completely electrified and is signalled by means of automatic colour lights. The four stations on the layout are connected in a realistic manner by electric telegraphs. Special attention has been given to the provision of suitable lineside scenery. Members are particularly keen on train operation, and track meetings are greatly enjoyed. Visits have been paid to the workshops of the Midland Railway at Perth and to the local railway signalling school. It is hoped to arrange further visits to the signal boxes at Perth Central Station and the locomotive running sheds at East Perth. The Commissioner of Railways, Mr. Ellis, takes a keen interest in the Branch and it has also been visited by the instructors of the Perth and Fremantle Signalling Schools. Secretary: J. Stanbridge, 285, Lord Street, Perth, W.A.

Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation, and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given below:

BICKLEY—J. A. Whyte-Venables, St. Hugh's, Bickley, Kent.

GREENFORD—R. A. Capps, 89, Halsbury Road West, Northolt Park, Greenford.

HUDDERSFIELD—D. Sandland, 12, Dryclough Road, Crosland Moor, Huddersfield.

NEWPORT—G. Williams, 69, Queens Hill Crescent, Newport, Mon.

Branches Recently Incorporated

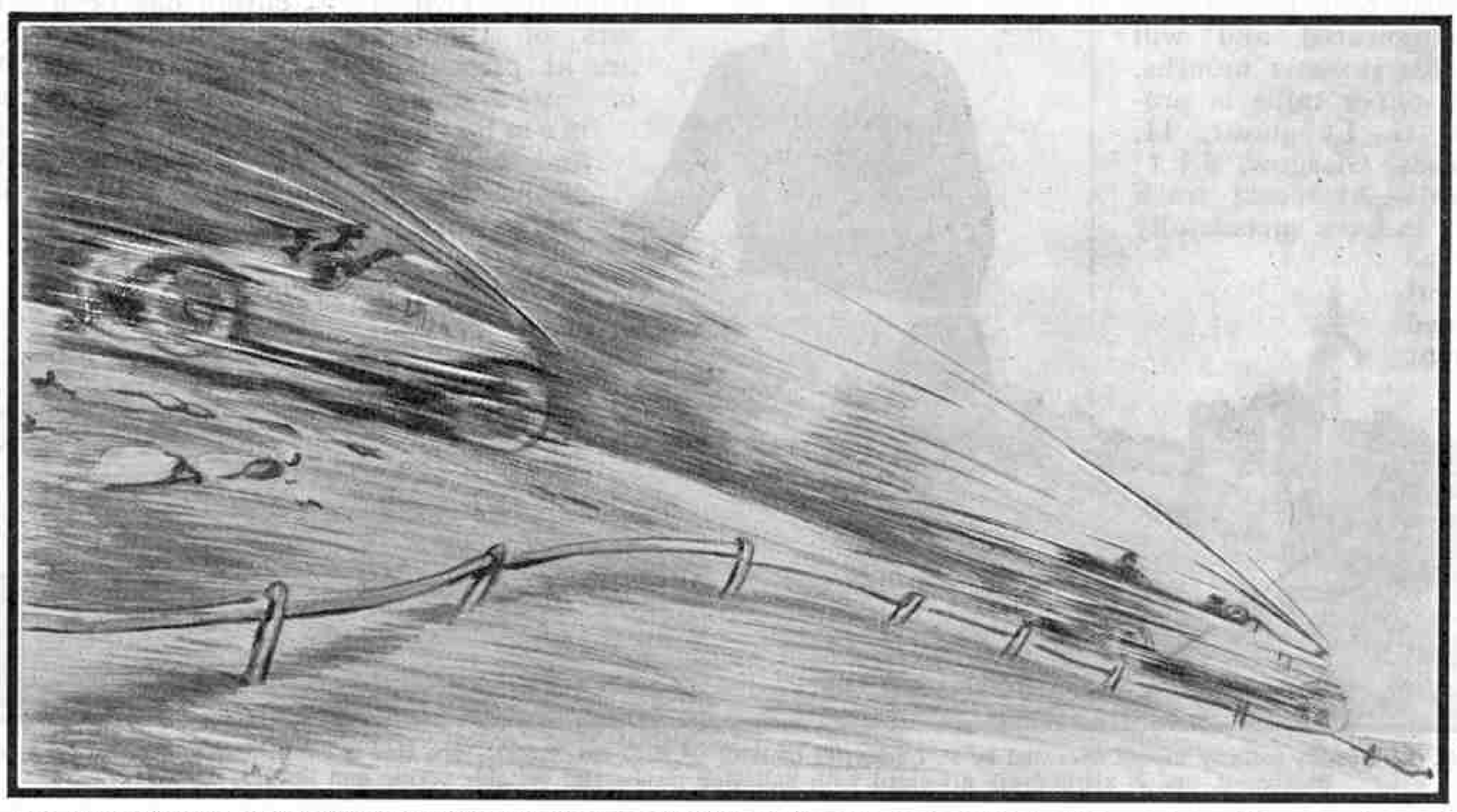
308. ACTON—S. Simmons, 7, Alfred Road, Acton, London, W.3.

309. ARDSLEY—G. Etherington, 3, Oxford Street, Ardsley, Barnsley.

II. Can a Policeman shoot a bandit in the car he is pursuing if both cars are travelling at the same speed as that at which the bullet leaves his gun?

THIS is an old puzzle that has appeared in many disguises. One of these pictures an exciting situation in which the guard of a train aims over the top of a line of open coal wagons at the engine driver, who of course is unconscious of his danger as he peers ahead. Is it possible for the guard to shoot the driver if the muzzle velocity of the bullet is equal to the speed of the train? In this form the problem is a little more convenient to deal with, and we shall see what happens to the engine driver before considering the problem of the policeman and the motor bandit.

To many people the solution to the problem seems easy; they cannot see how the bullet can ever reach its target, since both are travelling at the same speed. But let us think what this would involve. Suppose the guard repents of his murderous designs on the driver and decides instead to commit suicide. If then he happens to turn his back on the engine and tries to shoot himself in the middle of the forehead the bullet apparently could never reach him, because he is travelling away from it at a speed equal to its own. Thus his only hope of success would be to face the engine, so that he and the bullet would be travelling in opposite directions.



Can the policeman in the pursuing motor car shoot the bandit if both cars are travelling at 80 m.p.h. and the muzzle speed of the bullet in his gun also is 80 m.p.h.? This problem is dealt with in the accompanying article.

This is not exactly a matter for trial by experiment, and fortunately this is not necessary, as the problem can be reasoned out quite easily. It is clear that there is a flaw in the obvious solution already suggested, for it is absurd to suppose that the guard would have to be so careful and calculating about putting an end to his own career. The clue is to be found in the fact, often overlooked, that before the trigger is pulled the bullet itself is travelling at the same speed as the train. The effect of the explosion is to give it an extra kick forward, so that its speed is increased.

There is no difficulty in realising the truth of this by a few experiments with more harmless apparatus than a revolver. Anyone who is walking moves ahead more quickly if he is given a violent push in the back, and his extra speed is exactly the same as that which would have been given to him if he had been standing still when he was the victim of the blow in the rear.

As another example, suppose a heavy object, such as a small brass weight, is placed on a sheet of card and the two are moved rapidly through the air. What happens when the card is suddenly stopped? A single trial will show that the weight immediately shoots forward. The reason of course is that the weight shares the speed of the card, and in spite of its innocent appearance, it cannot be stopped except by force.

Exactly the same thing happens in many similar circumstances. If a lorry laden with bales of cotton or trusses of hay charges violently into a solid iron post that brings it to a standstill, the bales will topple forward because they are moving as fast as the lorry and there is nothing to stop them. The opposite happens when a lorry laden in this manner is started with a violent jerk, for the bales then tend to topple backward. Everybody who has travelled in a tramcar or a motor car has had similar experiences. A man standing up in a swiftly moving vehicle is shot violently forward when the brakes are applied suddenly, and he is thrown backward if it starts forward with a jerk.

Now let us see how this applies to the problem of the murder of the driver of a train by the guard. When the latter stands up and takes aim his bullet is already travelling at the speed of the train, say 60 m.p.h. As soon as he pulls the trigger an extra force is applied to the bullet that alone would be capable of giving it a speed of 60 m.p.h. The result is that its speed now is 120 m.p.h. It has no difficulty in travelling as far as the engine driver, for it speeds ahead of the guard's van at the rate of 60 m.p.h., that is to the extent of 88 ft. in every second, so that it would reach the driver in four seconds if the length of the train were 352 ft.

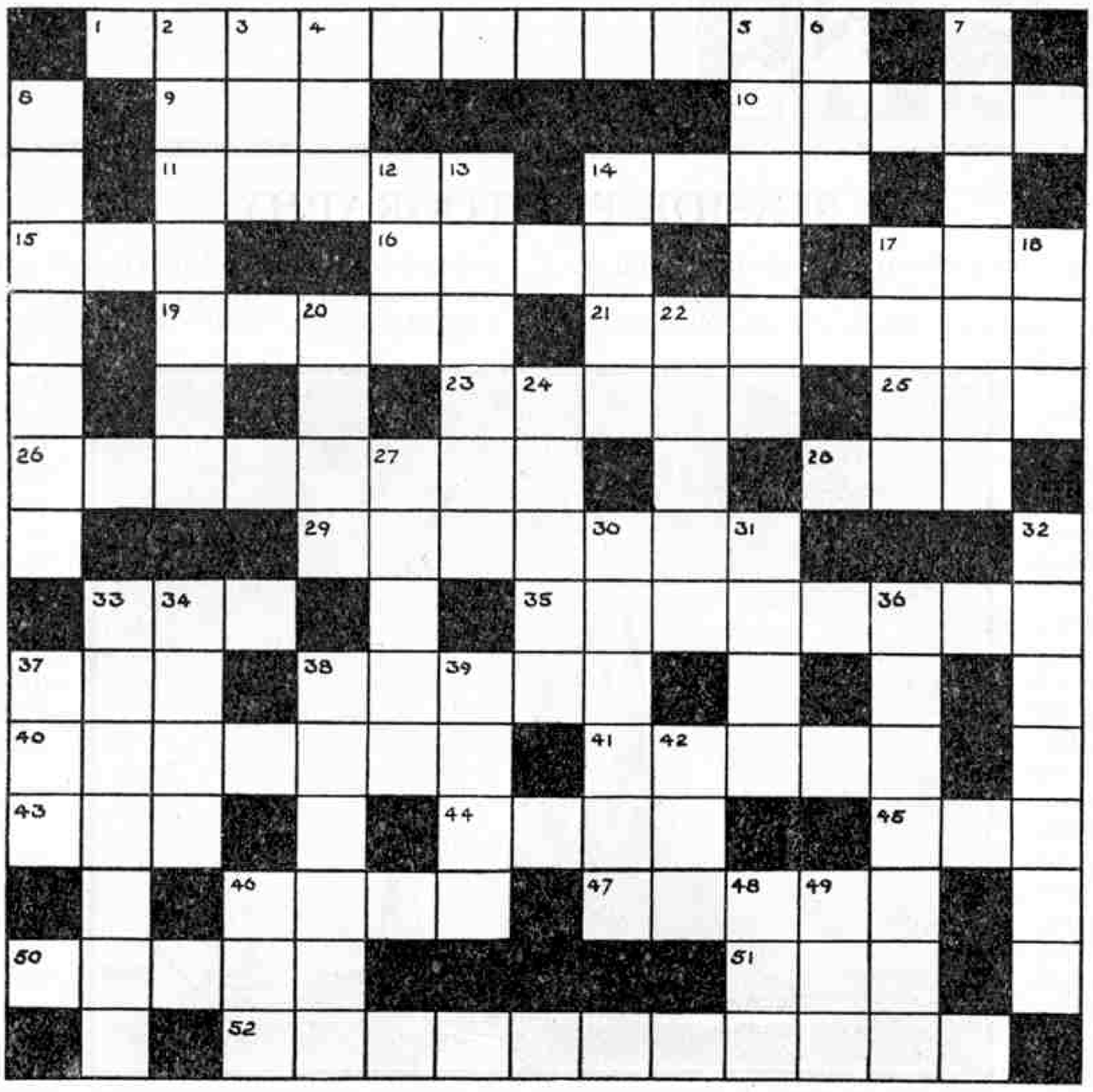
Returning to the policeman and motor bandit, suppose that the two cars are travelling at 80 m.p.h. This also is the speed at which the bullet leaves the policeman's gun—when the gun is still. As the gun has a speed of 80 m.p.h., it is clear that in this case the actual speed of the bullet is 160 m.p.h., and the motor bandit cannot hope to escape.

The penetrating power of a bullet is conferred upon it by its speed. In the case of the guard and the engine driver, the bullet is a deadly missile even when it seems to be lying innocently in the guard's gun. Why then does it not kill anybody, or at least make a hole in the woodwork of the train? The answer is that everything around it is moving at the same speed as itself, and it cannot become dangerous until it is given a much higher speed by the power derived from the explosion of the powder in the cartridge. If by any means it could be taken out of the gun and so placed that it could be intercepted by the hand of a man standing at the lineside, it would pass through his flesh and bone as easily as if it were fired from the gun when this was held still by the lineside.

The problem of course is one of relative velocity, and it is curious to think that even if the bullet were lying idly on the ground instead of in a moving train, it would be travelling at a very high speed, unless it were at one of the two Poles. For instance, at the Equator it would be carried round by the revolution of the Earth at a speed of more than 1,000 m.p.h. Yet it would be harmless, for it would have no speed relative to everything around it until fired from a gun. Then it would be effective, whether it were fired in the direction in which the Earth rotates or not. H. A. ROBINSON.

Competition Corner

AUGUST CROSSWORD PUZZLE



CLUES ACROSS

1. Comprehends
9. Organ of hearing
10. Artificial silk
11. Daub
14. Vessel
15. Denial
16. Yield
17. Health resort
19. Loaded
21. Voter
23. Challenges
25. Habituates
26. Objected
28. Poem
29. Messages
33. Animal
35. Annoyed
37. Skill
38. Moulds
40. Church dignitary
41. Moves
43. Point
44. Continually
45. To Freeze
46. Fixes
47. A tract of land
50. Holidays
51. Evening (abbrev.)
52. Varieties

CLUES DOWN

2. Cherish
3. Embankment
4. Before
5. Compels
6. Juice
7. Arrange
8. Anxiety
12. Expert
13. Perform
14. Prophet
17. Nail
18. Part of verb "to be"
20. Low hill
22. Affords
24. Fit
27. Entertain
30. Settled down
31. Stupefy
32. Speech
33. Reaches
34. Stage
36. Resident
37. Suitable
38. Fondle
39. Observes
42. Mistake
46. Flood
48. Calm
49. Figure

All "*M.M.*" crossword puzzles have enjoyed exceptional popularity, principally, no doubt, because they are set for amusement rather than strenuous competitive effort. This month's puzzle will be found to follow the lines of those set in previous issues in that it is fair and interesting. The clues are all perfectly straightforward, and every word used can be found in Chambers' or any other standard dictionary. The rules that govern the solution of crossword puzzles are so well known that it is unnecessary to give any further explanation of the requirements of the competition.

Cash prizes of 21/–, 15/–, 10/6 and 5/– respectively will be awarded in order of merit to the senders of the four correct solutions that are neatest or most novel in presentation. The prizes will be duplicated for the Overseas section, which is open to all readers living outside Great Britain, Ireland, and the Channel Islands.

Entries should be addressed "August Crossword Puzzle, Meccano Magazine, Binns Road, Liverpool 13," and must be sent to reach this office not later than 31st August. Overseas closing date 30th November.

Competitors need not mutilate their magazines by cutting out the crossword illustration. Instead they may make a copy of the square on the same scale or larger, and use that in submitting their entries for the contest.

August Photo Contest

As we announced in the April Magazine, each month throughout the summer we are offering prizes for the best and most interesting photographs submitted, and in this issue we announce the August Contest in this series. As in the previous competitions, this is divided into two groups, Home and Overseas, and each group again is divided into two sections, A for those aged 16 and over, B for those under 16. Cash prizes of 21/– and 10/6 are being awarded in each section.

The photographs may be of any subject and may be taken with any make of camera, while any kind of film or paper may be used in making the exposure and producing the prints. Each photograph must bear the reader's name, age and address, and a title on its back.

Entries must be addressed "August Photo Contest," Meccano Magazine, Binns Road, Liverpool 13, and must arrive not later than 31st August. The Overseas closing date will be 30th November.

Competition Closing Dates

HOME

August Crossword Puzzle	...	31st August
August Photo Contest...	...	31st August

OVERSEAS

May Crossword Puzzle	...	31st August
May Photo Contest ...	...	31st August
June Doublets Contest	...	30th September
June Photo Contest ...	...	30th September
July Sketchogram Contest	...	31st October
July Photo Contest ...	...	31st October
August Crossword Puzzle	...	30th November
August Photo Contest...	...	30th November

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of the competitions.

In sending entries to competitions that are divided into age groups, competitors should take particular care to mark their ages clearly on the back of the entry. It is not sufficient merely to indicate the age group, as age allowances are given to ensure equality of opportunity for the younger competitors.

COMPETITION RESULTS

HOME

June Doublets Contest.—1. C. E. Wrayford (Moretonhampstead, Devon); 2. F. F. Round (Southfields, London, S.W.18); 3. E. R. Andrew (Wellingborough); 4. L. Martin (Bournemouth).

June Photographic Contest.—First Prizes: Section A, R. F. Freke (Folkestone); Section B, J. R. Tottle (Taunton). Second Prizes: Section A, J. Hampson (Edgware); Section B, P. Sheldon (Hull). Special Prizes: R. H. Warr (Willaston, Wirral); H. H. Lees (Selly Oak, Birmingham).

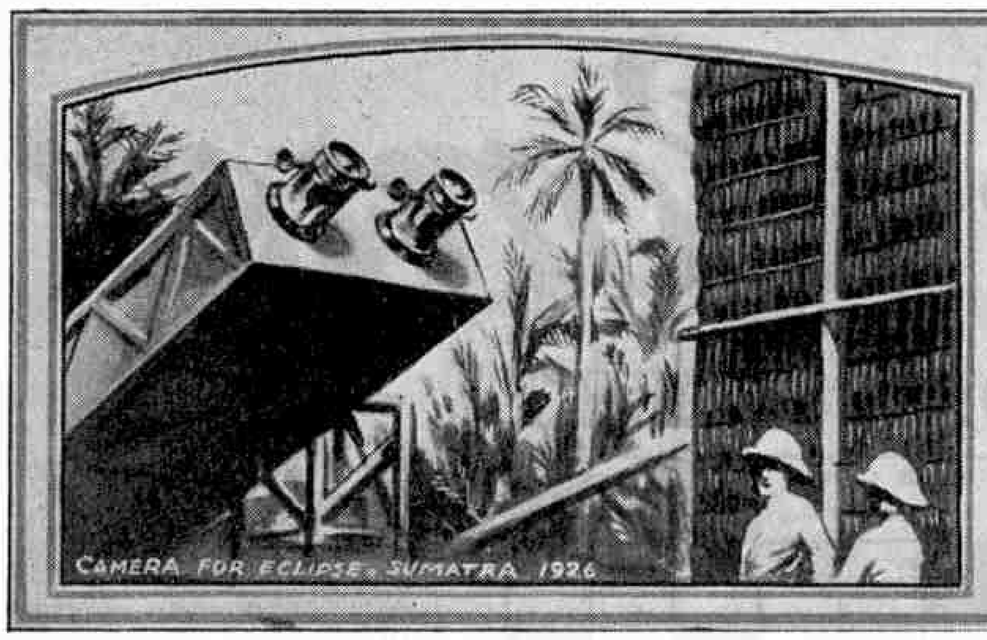
OVERSEAS

February Drawing Contest.—First Prizes: Section A, S. D. Kurlawala (Bombay); Section B, A. Puntman (Arnhem, Holland). Second Prizes: Section A, M. Conly (Dunedin, N.Z.); Section B, M. O. Akinsehinwa (Ibadan, Nigeria). Consolation Prize: J. Parminter Wairoa, N.Z.).

Meccano Limericks.—Last Line Section.—1. D. Murison (Buenos Aires); 2. G. M. Healy (Prince Albert, Sask.); 3. R. B. Latimer (Rangoon, Burmah); 4. A. Rutherford (Sumner, Christchurch, N.Z.).

New Limerick Section.—1. Barbara Hulley (Nantes, France); 2. Mrs. F. D. Mitchell (St. George's, Grenada, B.W.I.); 3. B. T. Roberts (Vancouver); 4. S. R. Thompson (Sydney).

March Drawing Contest.—First Prizes: Section A, M. Conly (Dunedin, N.Z.). Section B, R. Dickison (Roslyn, Dunedin, N.Z.). Second Prizes: Section A, C. Cali Corleo (St. Julians, Malta). Section B, R. L. Lowson (Caledon, Cape Province, S.A.).



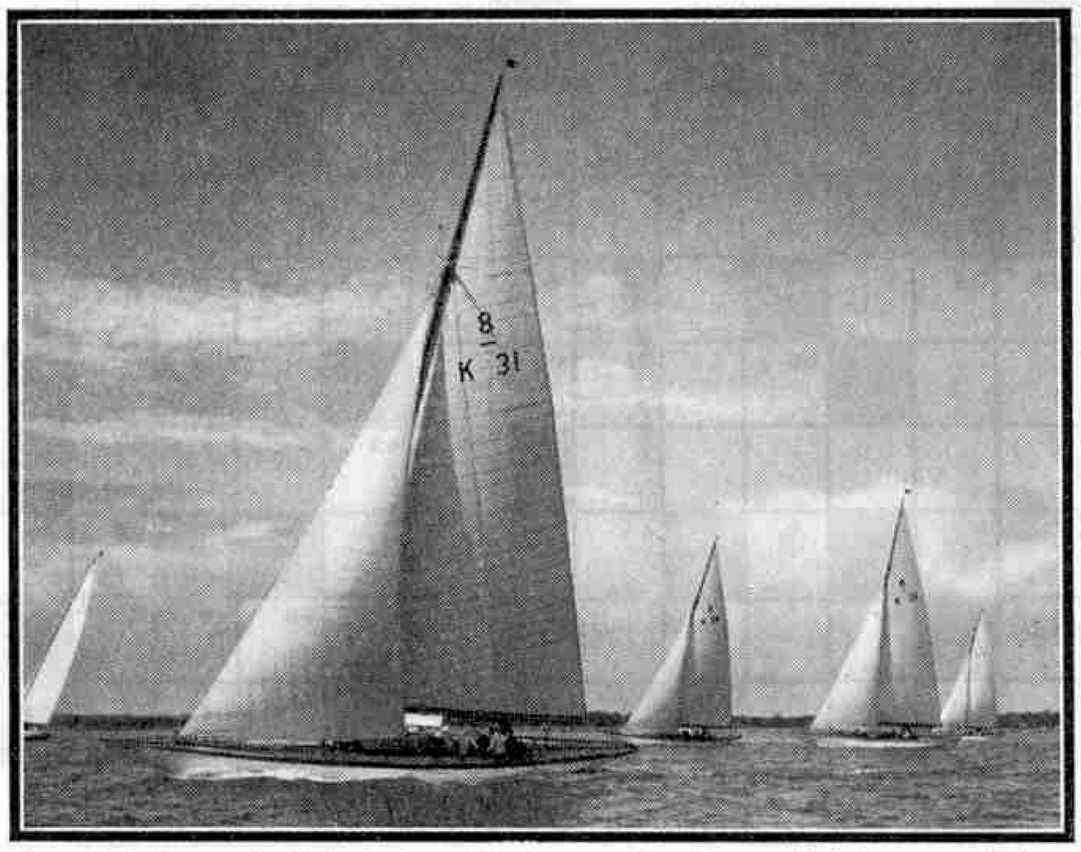
PHOTOGRAPHY

SEASIDE PHOTOGRAPHY

IT is safe to assume that the majority of our readers will spend a considerable part of this month on holiday at the seaside, and probably many will be using a camera for the first time. No better starting point could be chosen, for under-exposure, the bugbear of most newcomers to photography, is almost non-existent at the seaside in August. The light rays are so strong that even with the cheapest of box cameras an ample exposure can be given at any time on any reasonably sunny day.

It is not possible to lay down definite rules for exposure, but as a rough guide 1/25 sec. at F/11 would prove ample when snapping open seascapes at any time between 10 in the morning and 4 in the afternoon. The exposure should be doubled if beach scenes containing dark rocks or near boats or figures are included. These are merely suggestions, however, and we would recommend all our readers to use an exposure meter or a table such as is given in the Burroughs Wellcome handbook.

At the seaside there is no lack of subject matter for photographs. Indiscriminate and careless snapshotting should be avoided, however, for it is better to obtain a dozen really good pictures than 50 poor ones spoiled by over-eagerness.



Rounding the mark. A typical yachting scene. Negative on Selochrome roll film, reproduced by courtesy of Ilford Ltd.

It is a good plan to work out a scheme that will cover all the main features of the holiday, such as the departure from home, and arrival at the holiday resort. These pictures should be followed by a sequence of characteristic views of the resort, such as the launch and return of the lifeboat, yachting and bathing scenes, children playing on the sands or at the model yachting pool, coast scenery and so on. Such views should be varied with snaps of personal incidents, of course, for these after all must be the main feature of the holiday story. Finally the series can be completed by pictures of the return home.

Novices should not be tempted to waste films on wide rolling expanses of sea. However attractive they may appear to the eye, they are very difficult indeed to translate into satisfactory snapshots. It is better to concentrate on beach and rock scenes.

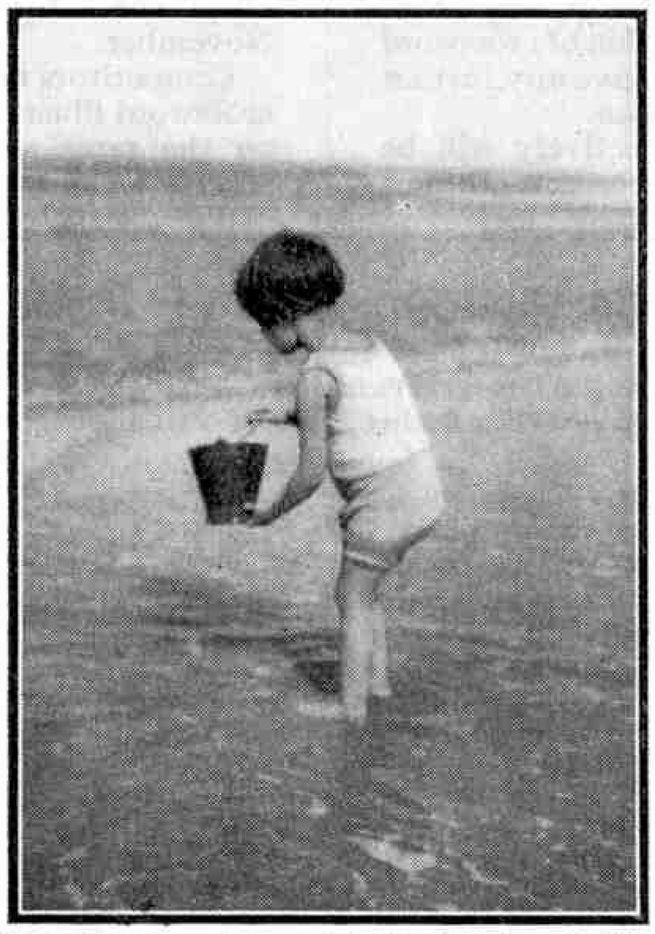
Most of our readers no doubt will be using roll film cameras, and only a few of them will be fortunate enough to possess a camera in which the focussing is visible up to the moment of exposure. The focussing problem, therefore, calls for some consideration.

The simple box camera with its so-called fixed focus does not present great difficulty. The makers have fixed the relative positions of the lens and the film to give the best average result, and usually with such cameras it may be assumed safely that everything beyond six feet away from the camera will be in focus.

The folding camera, with which focussing is achieved by altering the distance between the lens and the film, calls for more care and experience. Usually this type of camera is fitted with a focussing scale marked for distances of 6, 9, 15 and 25 feet, and beyond that with the letters "INF" representing "Infinity" or extreme distance.

When the camera is set at, say, the point on the scale marked 15 feet, all objects 15 feet distant from the camera are in sharp focus, but objects slightly nearer and beyond also are in focus. This range of distance is known as "depth of focus," and it is the salvation of the photographer who cannot accurately estimate distances. It is helpful, therefore, and not at all a difficult matter to ascertain the depth of focus of one's own camera.

The exact depth of focus is dependent upon the "focal length" of the lens and the size of the shutter "stop" employed. The focal length is ascertained by setting the camera at "infinity" and measuring the distance from the lens to the film. In the case of cameras using "double," rapid rectilinear, or "anastigmat" lenses, the measurement is made from the shutter. The sizes and positions of the various "stops" are usually marked on the front of the lens mount, but, if they are not so marked, they can be ascertained by dividing the diameter of the shutter opening into the distance from the shutter to the film. The usual "stop" sizes available on cheaper types of cameras are known as F/8, F/11, F/16, F/22 and F/32. Box type cameras rarely have a larger stop than F/11.



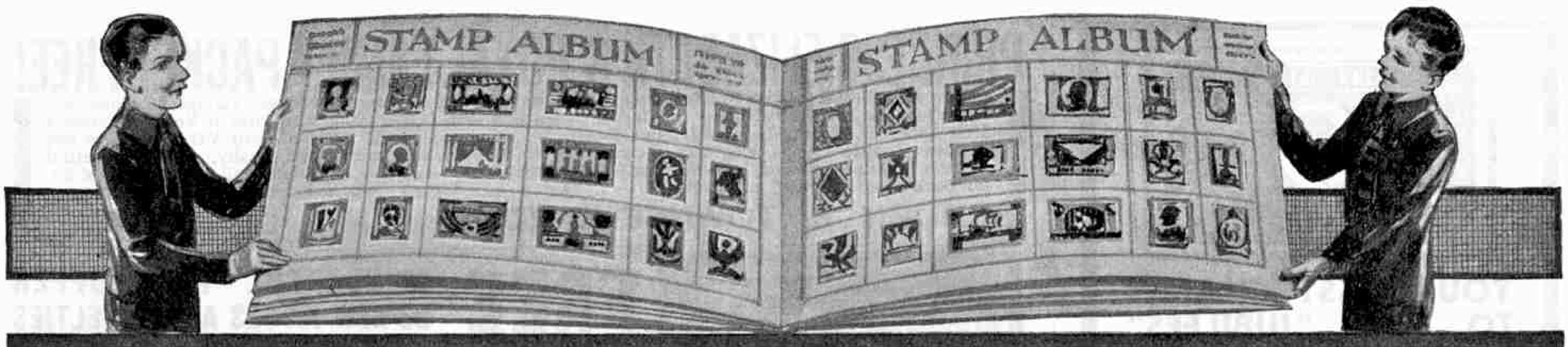
Water for the castle moat. A "Kodak Snapshot."

The focussing point that will give the greatest possible depth of sharp definition, or the hyperfocal distance, as the photographer calls it, is ascertained by multiplying the square of the focal length by 100, and dividing the result by the F number of the stop multiplied by 12.

To illustrate this point let us assume that we have a camera in which the depth from lens to film is five inches, and the shutter aperture is five-eighths inch. The stop number of the aperture is therefore F/8. The hyperfocal distance is $5 \times 5 \times 100$, or 2,500, divided by 8×12, or 96. This works out at 26 ft.

If we set our camera focussing scale at 26 feet and use stop F/8, all objects from 13 ft. (half the hyperfocal distance) to infinity will be in focus, and the point of sharpest focus will be at 26 ft. If we set the camera scale at Infinity everything beyond 26 ft. will be focus. This is more difficult to describe than to do, and readers will find it a very simple matter to work out the figures for their individual cameras and stops.

There is one final word of advice for every reader, and that is to make sure that the camera is in thorough working order before the holiday starts. It also is a good plan to allow a local photographic dealer to develop the first spool of film. If the results are good, the photographer can then go ahead, happy in the knowledge that his exposures are correctly judged.



STAMP COLLECTING

OLYMPIC GAMES STAMPS

THE outstanding international event this month is the 11th series of Olympic Games that will be held at Berlin from 1st to 16th August. It is therefore appropriate to devote this month's talk to Olympic Games stamps, of which there are so many that in themselves they constitute a sports stamp collection of the greatest interest.

The story of the Olympic Games goes far back into dim antiquity, so far back indeed that we read of their being reorganised in the 9th century B.C., and records have been preserved since 776 B.C. They were held every fourth year at Olympia, one of the great religious centres of Greece, and in the Greek calendar each period of four years was known as an Olympiad, the individual years being described as the first, second, third and fourth of their particular Olympiad. Then, as now, the honour of a victory at the Olympic Games was its own reward and the only trophy was a garland of laurel.

In ancient times the Games were largely confined to a few field and track sports, such as running, jumping, discus throwing and javelin throwing, but since their revival in the modern world almost every athletic game and pastime has been included. Cricket is a notable exception, but this game is peculiar to the British.

The first of the present International Series of Olympic Games was held at Athens in 1896 and the event was celebrated by a special commemorative stamp issue, the first ever produced by Greece. The designs were devoted largely to pictures of ancient Olympic scenes, such as a gladiator fight (1c. and 2c.); a discus thrower in action (5c. and 10c.); and a chariot race (25c. and 60c.). In addition the series included a view of the ancient Stadium at Olympia (1 dr.), and various allegorical figures depicting victory and youth.

Since 1896 the International Games have been held every fourth year, in accordance with the Greek tradition, except in 1916, a break for which the Great War was responsible. In 1900 the games were held in Paris, in 1904 at St. Louis, U.S.A., in 1908 in London, and in 1918 at Stockholm. After the end of the war the games were resumed in 1920 at Antwerp, and in honour of the occasion the Belgian Post Office issued a short series of three charity stamps with designs showing a discus thrower (5c.); a chariot race (10c.); and a runner (15c.). Each of the designs was based on early Greek pictures.

Belgium may be considered to have founded the custom for the country acting as host to the Olympic Games to issue commemorative stamps, for each subsequent series of games has been so honoured. In 1924, when the Games were held at Paris, France issued four stamps, 10c. to 50c. in value. The designs for these stamps were confined to allegorical features, on the lines of our illustration of the 10c. value, in which a laurel-garlanded athlete is seen with saluting arm outstretched towards the Olympic Stadium and the Arc de Triomphe. Another interesting stamp in this series is the 30c. value, which shows a magnificently built athlete splitting a tree trunk with his bare hands.

The Dutch stamps issued for the Amsterdam Games of 1928 were devoted to sporting types. There were eight designs, the list being as follows: 1½c., Sculling; 3c., Association Football; 5c., Yachting; 7½c., Putting the Weight; 10c., Running; 15c., Riding and 30c., Boxing. The 7½c. value is illustrated on page 491.

Winter sports, such as ski-ing, skating, sleighing and ice hockey, came into the programme for the first time in 1924, but this section was not marked by commemorative stamps until 1932. In that year the Games were held in the United States. Lake Placid, New York, was the scene of the Winter Games, and the Summer Games were celebrated at Los Angeles. The 2c. stamp, bearing a striking ski-ing scene that is illustrated here, was issued in connection with the Winter Games, and two stamps, 3c. and 5c. appeared later in commemoration of the Summer Games. The 3c. design, showing a sprinter on his mark, which also is illustrated here, is a splendid action picture and probably is the finest sports design ever issued on a stamp. The 5c. shows a statue of an ancient Greek discus thrower over a map of the American Continent.

Germany is acting as host this year and three stamps, 6pf., 12pf. and 25pf. values, were issued in November last for the Winter Games at Garmisch-Partenkirchen. These show skating, ski-jumping and bob-sleighing scenes respectively, and the second and third of these stamps are illustrated here. For the Summer Games at Berlin a long series of eight stamps, 3pf. to 40pf., have been issued. Two specially good designs are those of the vaulter on the 3pf. and the javelin thrower on the 8pf., but the most interesting of all is the 12pf., featuring a relay runner bearing a lighted torch.

The design of the 12pf. stamp has no connection with the competitive sports, but is intended to symbolise the bearing of a torch of "sacred fire" from Olympia, the original home of the Games, across Europe to the Stadium at Berlin. No fewer than 3,000 runners are taking part in this, and the last will carry the torch into the Stadium at the moment when the competitors from 50 nations march into the arena for the inauguration of the 1936 Games. An Olympic Flame on the Summit of the Stadium Tower will be lighted from the torch, and simultaneously there will be unfurled a great white flag, bearing five linked rings to symbolise the five continents of the world. This symbol can be seen on the fronts of the tunics worn by the figures shown on the stamps. The remaining designs in the series are as follows: 4pf., Diving; 6pf., Football; 15pf., Fencing; 25pf., Rowing; 40pf., Steeplechasing. (*Continued on page 491*)

YOUR LAST CHANCE TO GET "JUBILEES" CHEAPLY!

On September 1st the prices of the popular SILVER JUBILEE stamps on our special SILVER JUBILEE APPROVAL SHEETS will be raised. For August **only** you can get them at the old prices. Definitely your last chance, so write **to-day** for a SILVER JUBILEE APPROVAL SHEET.

STANLEY GIBBONS LTD.,
Dept. S15, 391 Strand, London, W.C.2

Stamps Bought, Sold, Exchanged.—Burley, 21, Jardine Road, Aston, Birmingham, England.

PRINCESS ELIZABETH & ROYAL FAMILY PACKET FREE!

You should send for this wonderful packet immediately. It contains 32 different stamps, including our beautiful little Princess, who may one day be Queen Elizabeth II, her father, the Duke of York, the present Heir-Apparent, King Edward VIII in Colonel's uniform, and an old King Edward VII. There are five different Jubilee stamps, long sets of Spain and Bohemia in this packet and, finally, a large, beautiful pictorial Jubilee depicting both the late King George and Queen Mary. Absolutely all free. Just send 2d. for postage and request approvals. (*Stamp Collections and Loose Lots Purchased.*)

LISBURN & TOWNSEND (Dept. M.M.), LIVERPOOL 3

FREE WONDERFUL 1936 OFFER 25 NEW ISSUES AND NOVELTIES

Including **Andorra** (1935), fine new **Cayman Islands** (map of Islands), obsolete Austria, China, Denmark, **Gwalior** Service, Hungary (Statesman Szechenyi), **new Kenya** (Kavirondo Cranes), **Roumania** (new portrait of King Carol), and many others. I will send this collection **absolutely free** to all stamp collectors sending 2d. postage (abroad 4d.).

G. P. KEEF, Willingdon, EASTBOURNE

THE "DIAMOND" PACKET IS THE ONLY PACKET

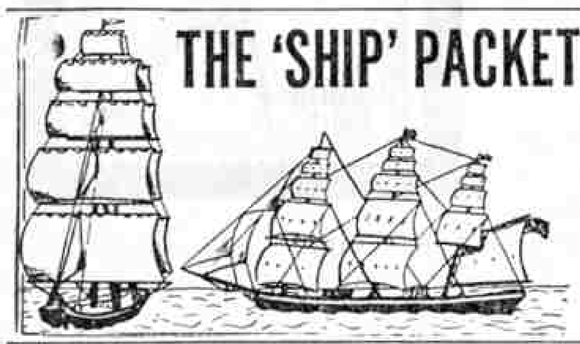
OF UNSORTED STAMPS ON THE MARKET with 15 years' reputation behind it. It contains approx. **1,000 UNSORTED STAMPS** from Convents abroad. **MANY RARE STAMPS** have been found in it. 1 pkt., 1/6; 3 pkts., 3/9; 5 pkts., 6/–. All post free inland. Colonies 3d. per pkt. extra. Foreign, 6d. extra.

Ask your stationer for the "Diamond" packet.

SPECIAL: TURKS IS. JUBILEES complete set, used or unused, 5/6.

O. NERUSH (Dept. A), 68, TURNPIKE LANE, HORNSEY, LONDON, N.8

THE 'SHIP' PACKET



This marvellous packet is offered under cost as an advertisement, **45 different stamps each with a ship on it.** A regular armada. **GABOON,** New Issue **SENEGAL** (Canoe), wonderful flotilla of caravels from **DENMARK** (complete set), **NEW CALEDONIA, IVORY COAST, COSTA RICA,** a fleet of **7 CHINESE** junks usually sold at 10d., **TRINIDAD & TOBAGO, MAURITIUS, SOUTH WEST AFRICA, NEWFOUNDLAND, U.S.A., B. GUIANA,** set of **S. AFRICA, GREECE, POLAND, INDO-CHINA, FRENCH OCEANIA,** etc. Price **4½d.,** postage 1½d. (abroad 3d. extra). Purchasers of this packet asking for approvals receive **FREE** set of **4 SPAIN** (Columbus, each with his ship on it). Senders of addresses of stamp collectors receive **FREE** set of **6 VENEZUELA** or **6 PERSIA, 100 BRITISH COLONIALS 1/–, 20 AIRPOST 6d., 6 TRIANGULARS 6d., 50 PERSIA 4/–, 2 ASTRID** (mourning stamps) **2½d., VOLUMES OF B.O.P. CHEAP.**

H. C. WATKINS (M. Dept.), Granville Road, BARNET

SETS (POSTAGE EXTRA)

5	Cameroons	...	3d.	5	Togo ...	...	3d.
10	„	...	6d.	10	„ ...	...	6d.
5	Gold Coast	...	3d.	15	„ ...	...	10d.
10	„ „	...	6d.	20	„ ...	...	1/2
15	„ „	...	10d.	25	„ ...	...	1/6
20	„ „	...	1/2	5	Syria ...	...	2d.
1	„ „	Jubilee	2d.	10	„ ...	...	5d.
5	Nigeria	...	3d.	15	„ ...	...	8d.
10	„	...	6d.	4	Lebanon	...	2d.
15	„	...	10d.	5	Palestine	...	2d.
20	„	...	1/2	10	„	...	5d.
1	Nigeria Jubilee		3d.	10	New Zealand		2d.
5	Sierra Leone...		3d.	15	„ „		4d.
10	„ „	...	6d.	20	„ „		6d.
15	„ „	...	10d.	10	Ceylon	...	2d.
1	Sierra Leone Jubilee	...	3d.	15	„	...	4d.

J. RUSSELL
23, Shanklin Drive, Westcliffe-on-Sea

ONE THOUSAND STAMPS ON APPROVAL

From which you may select any 100 for 3/–. This selection is not made up of the very commonest varieties, but contains stamps catalogued at 1/– each or more. (I do not sell less than 100.) During this month I will include in all selections a stamp catalogued at least 3/–. Can you find it?

H. HARDY, "Hoyland," Potter Heigham, Norfolk.

ARE YOU AIRMINDED ? ? ?

Yes! Then send for the greatest Airmail Packet we have ever offered. Besides the attractive △ **Air Stamp of Mozambique,** the packet includes **Egyptian, Indo-China, Latakia, Ecuador, Spain** and **Syrian** Airmails. Some of the most famous aircraft built are depicted on the beautiful stamps of this magnificent packet.

1'6 USUALLY SOLD AT 1/6. FREE AND POST FREE to approval applicants.
THE UNIVERSITY STAMP CO., 13, WALTON WELL ROAD, OXFORD. **FREE**

AIR MAILS

We offer a unique air mail service under which air mail covers (including first flights) can be sent to you from any country in the Empire and from most foreign countries. Cost: 25 per cent. above face value of stamps used.

Write for full particulars of this service and of supplies of **first day covers** of all **King Edward VIII stamps** as issued.

ARCHIBALD F. McQUARRIE,
83, Cliff Road, Wallasey, Cheshire.

FREE. Hong-Kong Jubilee. Send P.C. only.—Pukka Stamp Co., Normandy Avenue, Barnet.

FREE.—Four different Iraq to applicants for ½d. Approvals.—Cox, 21, Dennis Mansions, Westcliff.

FINE APPROVAL SELECTIONS

My Stock contains fine condition medium and scarce stamps of nearly all countries. Now breaking several Colonial and Foreign collections at real **Investment Prices.** Mention your interests and References, please.

B. Max Campbell, B.P.A., Haldon Avenue, Teignmouth.

FREE SETS of STAMPS

6 Cuba or 6 Imperial China or 6 Straits Settlements or 6 old French, etc. Just send stamps value 2d. and ask for my Approval Sheets containing some high value stamps at low prices and with progressive discounts. State which set of stamps desired to be sent free.

P. ILLINGWORTH,
TRANMERE PARK, GUISELEY, near LEEDS.

CHEAP APPROVALS

My beautiful Approval Selections are ideal for filling those vacant spaces. Pictorials, Colonials, and hard to get items. Selections from 4 a 1d. Free Gift Bi-coloured Persia all applicants.

A. V. TAPP,
108, CHESTERFIELD RD., BRISTOL

MINT ST. LUCIA NEW ISSUE FREE

This handsome stamp together with 25 other fine **BRITISH COLONIALS** (including soon to be obsolete King George issues) will be sent FREE to all genuine applicants for my **MODERN** approvals and sending 2d. Postage (6d. Abroad).

S. CAMPBELL, 71, Manor Rd., Tankerton, Kent.

SPECIAL AUGUST OFFERS

JUBILEES. CANADA Used **COMPLETE** set	2/–
15 COLONIAL JUBILEES, used, different ...	1/6
20 BRITISH COLONIALS, Mint, New Issues	1/4
100 PERSIA, all different, incl. Air	2/9
4 BELGIUM, "Queen Astrid"	6d.
6 MONGOLIA, Pictorials (Cat. 3/4)	7d.
6 BERMUDA, ½d.-3d. K.G. Pictorials, new issue	1/3

Cash with order. Postage extra.

T. R. HUGHES, 'Ibis Cottage,' Long Park, Amersham

EVERY COLLECTOR NEEDS THIS ILLUSTRATED BOOK

Zoo in a Stamp Album—Ship Stamps—Watermarks—The Aerodrome—Single Country Collections—Olympic Games—Loose-Leaf Albums—Earthquake Stamps—Washing Day in the Stamp World—Three-cornered Market Place—British Empire Albums—Rare Stamps—Overprints and Surcharges—To Correspondents Abroad—Treasure Trove—Triangular Packets—Packets of British, French, Italian, Portuguese, Spanish and German Colonials—Building a Collection—West Indian Packets—Triangular Stamps—Philately Royal—Albums for Beginners—Penny Sets—English Men on Foreign Stamps—Emergency Papers—Shilling Sets—Advertising Stamps—Strip Pocket Books—Glossary—Stamp Tongs—Punctured Officials—etc., etc., etc. These are only a few Headings out of my **SIXTY-PAGE BOOK,** which is **WELL ILLUSTRATED THROUGHOUT** and so full of the right sort of useful and interesting Philatelic information that **EVERY STAMP COLLECTOR MUST HAVE THIS BOOK,** FREE and POST FREE from

EDWARD SANDELL, 10, EVELYN GROVE, SOUTHALL, MIDDLESEX, ENGLAND.

For other stamp advertisements see page xvi.

Stamp Collecting—(*Continued from page 489*)

In addition to the stamps issued in connection with the International Olympic Games series proper, there have been associated issues from other countries, either to commemorate participation or to celebrate an important victory in the Games. There also have been many other sports stamps relating to semi-international sports meetings, such as Austria's beautiful winter sports issues, the striking Philippine Islands series of 1934 issued in connection with the Far Eastern Championship Games series, the 1935 Central American Olympic Games issues from Colombia, Cuba and San Salvador, and the Balkan Olympic Games issue of 1931 from Bulgaria.

We have selected one or two stamps from these issues for illustration here, but unfortunately there is not space in this article even to deal briefly with the general nature of the designs of these issues. We dealt with many such stamps in an article on Sports Stamps in the April *"M.M.,"* however, and readers who wish to form a complete collection of stamps bearing sports designs will find that article very helpful.

United States "Heroes" Stamps

This month the United States will commence the issue of a series of 10 commemorative stamps, to be known as "Heroes" stamps, in honour of celebrated figures in American naval and military history.

The first of the stamps, two 1c. values, one with a naval and the other with a military design, will appear about 1st August. The other stamps will follow at monthly intervals, two 2c. values on or about 1st September, two 3c. on 1st October, two 4c. on 1st November and two 5c. on 1st December. There will be 17 portraits in all, the list comprising nine naval and eight military "heroes." Seven of the stamps will carry two portraits each and one three, and the remaining two will have on them pictures of military and naval academies.

Four of the naval commemoratives will have on them portraits of the following: 1c., John Paul Jones and John Barry; 2c., Thomas MacDonough and Stephen Decatur; 3c., David Glasgow Farragut and David Dixon Porter; 4c., George Dewey, William Thomas Sampson and Winfield Scott Schley. The fifth, the 5c. value, shows the United States Naval Academy at Annapolis.

The heroes in the Army list are as follows: 1c., George Washington and Nathaniel Greene; 2c., Andrew Jackson and Winfield Scott; 3c., Ulysses Simpson Grant and William Tecumseh Sherman; 4c., Robert Edward Lee and Thomas Jonathan ("Stonewall") Jackson.

Stamp Gossip
and Notes on New Issues

Buying Stamps Abroad

This month many of our readers will sample the delights of sea-cruising for the first time, and most of them will desire to bring back souvenirs of their trips in the form of stamps from each country visited. Few souvenirs can be so interesting, more especially in those cases where the stamps bear pictorial designs. We should advise our readers to be cautious, however, should they desire to buy other than current stamps from local post offices. Occasionally it may be possible to pick up bargains from itinerant vendors, but in the long run it will prove more economical to go to the local stamp dealer and pay higher prices for reliable specimens.

We read recently of a young collector who picked up some odds and ends of Greek stamps from a seaside hawker in Greece. He was shrewd enough to confine his purchases to Greek stamps, but when he returned to England and ventured to soak the stamps off their paper, he found to his disgust that every single specimen consisted of two parts skilfully patched together!

Stanphil Stamp Books

Readers who are specialising in subject collections, such as we have recommended on many past occasions, will be interested to know that Stanley Gibbons Ltd. have published three additions to the Stanphil Series of books dealing with stamp designs.

The first of these is *"Land Transport in the Stamp Album,"* by A. E. Gould, and deals with the various methods of carrying goods and passengers that have been employed throughout the ages. Stamps illustrate every stage of progress from the chariots of ancient Greece and Rome, and the reindeer sledges of the Russian steppes, to modern streamlined Diesel-electric trains, represented by the *"Flying Hamburger."* This is demonstrated in the book, which will be invaluable to every collector of engineering stamp designs.

The other additions to the series are *"The Stamp Zoo,"* Parts I and II, by L. P. W. Renouf. In them the author has made the most of an ideal subject for a specialised subject collection, as many countries have depicted on their stamps the more notable wild creatures found in them. Part I deals with Beasts, and Part II with Birds, Fishes and Reptiles. Stamp illustrations of every creature mentioned are included, together with special drawings by the author.

Stanley Gibbons Ltd. also have published a third edition of Mr. Stanley Phillips' popular handbook *"Stamp Collecting for All."* This edition has been completely revised and new plates have been added.

These books can be obtained from any stamp dealer, price 1/– each, or 1/1½ post free from Stanley Gibbons Ltd., 391, Strand, London, E.C.2.

South Australian Centenary

To celebrate the centenary of the foundation of the city of Adelaide and the State of South Australia, the Commonwealth Post Office will issue a special commemoration stamp issue on 2nd August.

There will be three values, 2d. red, 3d. blue, and 1/– green, each using a design showing a composite picture of the original site of Adelaide and King William Street, the city's main street, as it is to-day. The old gum tree at Glenelg, under which the proclamation founding the State and its capital city was read, will be shown in the foreground.

New Stamps for Fiji

Designs for a new series of stamps for Fiji were invited in a recent official notice in the Fiji *"Royal Gazette."* Fiji is one of the few British Colonial Possessions that hitherto have remained loyal to the King's Head design, but a change to pictorial stamps in the projected new series is foreshadowed by the intimation that the new designs may feature characteristic scenery and industrial or agricultural pursuits. The King's Head must be included in each design.

* * * *

It has been announced that the Vienna Educational Council is arranging that each school under its control is to have at least one experienced philatelist upon its teaching staff. The value of stamp collecting as a means of acquiring a sound knowledge of the world appears to be well recognised in Vienna, and stamp collectors among the boys attending schools there will appreciate the opportunities the arrangement will give them of discussing their hobby with a master who is an expert.

The Gibbons 1937 Catalogues

Stanley Gibbons Ltd. advise us that owing to the unprecedented demand for their 1936 catalogues, which resulted in supplies being exhausted very early, it has been decided to issue the 1937 editions on 1st September of this year.

It will be remembered that the 1936 issue of the Simplified Catalogue met with so great a demand that supplies were entirely sold out in February last. An entirely new edition was then produced, but this in turn was sold out in a few weeks, making a further printing necessary. A large reprint of the full catalogue was ordered on the day on which it was published, but this has been out of print for some months.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.

TOO TRUE

Customer: "That man that's just left tried to make me believe he'd driven the same car for five years and never paid a penny for repairs. Do you believe that possible?"

Garage Proprietor: "It's possible, all right! I'm the man that's done his repairs."

* * * *

"What's the shape of the earth?" asked the teacher, calling suddenly on Wee Wullie.

"Round," said Wee Wullie.

"How do you know it's round?" asked the teacher.

"Well, it's square then; I dinna want any argument about it."

* * * *

Caller at Telephone Exchange: "These flowers are for the 'phone girls."

Supervisor: "Oh, thank you, sir, you flatter our service."

Caller: "Flatter nothing, I thought they were all dead."

* * * *

The chairman of a village council announced that the clerk wanted a supply of ribbons for the typewriter. Immediately a member protested against such extravagance. "She may be a nice girl," he said, "but I don't see why she should be provided with finery at the expense of the public."

* * * *

Teacher had been explaining the Order of the Bath, which is a decoration given by the King.

"Now, Freddie," she asked, "what is the Order of the Bath?"

"Well, Miss," replied Freddie, "in our house it's baby first, then Peter, Johnny next, and I come last."

* * * *

Inexperienced Mountaineer (pointing from door of hotel): "I'm going to scale that peak to-morrow, and I want your advice. Tell me, what preparations must I make?"

Hotel Proprietor: "You must pay me in advance for your stay, sir!"

* * * *

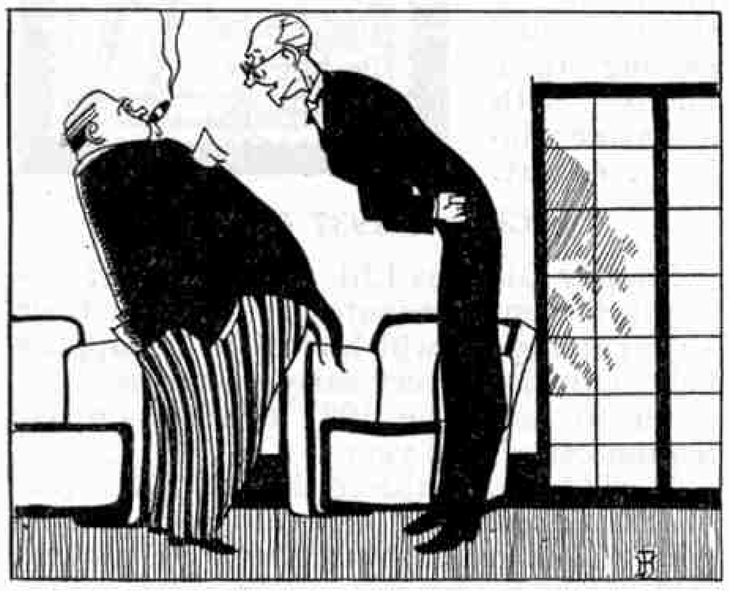
Riley met with an accident, but the next day managed to crawl to work.

"Why didn't ye stay home for a week or two?" said Finnigan. "Worn't ye carryin' an accident policy?"

"I wor not, bad cess to me carelessness!" said Riley. "I had left it at home on the kitchen dresser."

* * * *

CAUSE AND EFFECT



A very thin man met a very fat one in the hotel lounge.

"From the look of you," said the latter, "there might have been a famine."

"Yes," was the reply, "and from the look of you, you might have caused it."

* * * *

After buying a railway ticket a woman was asked by the booking clerk whether she would take an insurance ticket.

"No thanks," she replied, "We are always taking tickets for this and that, and we never have any luck."

A SHORT STORY

Act One. "Good evening, Officer."
Act Two. "Good morning, Your Honour."
Act Three. "Good day, Warder."

* * * *

Employer: "You don't seem to have had enough experience to suit me."

Applicant for work: "Experience? Why I have been in 13 places in three months. Surely that ought to be enough experience."

* * * *

ON THE SCENT

An Irishman, whose wife was fond of moving from one house to another, was met by a friend while walking behind a vanload of household goods.

"Halloa, Mick, shifting again? Where might you be going this time?"

"I don't know," said Mick. "I'm following the furniture to find out."

* * * *

Tom: "My uncle was a great man. He dug the Mississippi River and threw the dirt out and made the Rocky Mountains."

John: "That's nothing; you know the Dead Sea? Well, my father killed it."

* * * *

Old Gentleman (having fallen downstairs at a big stores): "Help! Help! I've broken my leg."

Shop Walker: "Artificial Limb Department three doors on the left, sir."

* * * *

"Why are these envelopes addressed so badly?" an employer asked his office boy.

"The new nibs won't write, sir."

"And why have you let my fire go out?"

"The new coal won't burn, sir."

"And what new thing caused you to be late this morning?"

"Neuralgia, sir."

* * * *

Stan.: "Did you go ahead with your singing lessons?"

Les.: "No. The teacher told me it would take years of hard study to sing as well as I thought I could sing already."

* * * *

Teacher: "Now Charlie; in front of you is east, at your right south, at your left north; what is behind you?"

Charlie: "Please, sir, it's a patch on my trousers. I told mother you'd notice it."

* * * *

"Your handwriting is very bad," said a man to a young college friend. "You ought to learn to write better."

"Yes," replied the young man, "but if I were to write better, people would be finding out how badly I spell."

* * * *

Camper: "Well, what's on the menu?"

Camp Cook: "Why, we have thousands of things to eat."

Camper: "What are they?"

Camp Cook: "Beans."

ON THE MARCH

The new lance-corporal, watched by his sergeant, had the squad marching away from him. The men had gone some distance, and it appeared that the corporal had forgotten how to give the command, "About turn."

At last, when the men were about 100 yards away, the exasperated sergeant yelled: "For 'eaven's sake say something, even if it's only 'good-bye.' "

* * * *

Teacher: "Thomas, make up a sentence using the word 'archaic.' "

Thomas: "We can't have archaic and eat it too."

* * * *

A young typist had just obtained employment and was taking down letters for the first time. "I didn't quite get that," she said, after the first letter had been dictated.

"What didn't you get?" her employer asked.

"Well, I'm not quite sure what comes between 'Dear Sirs' and 'yours truly.' "

* * * *

Smith: "Johnson's address was well timed, wasn't it?"

Brown: "Yes, two-thirds of the audience had their watches out before he finished."

* * * *

White: "What is the best way to make your dog walk behind you?"

Black: "Walk in front of him."

* * * *

Sandy had been on a foraging expedition, and had returned with a good fat hen under his arm. He was about to decapitate it for roasting when another Scotsman interfered.

"Will ye no bide a wee, Sandy?" he suggested cautiously. "Leave that bird till the morning. She micht lay an egg."

* * * *

A lady on a cruise, noticing that the boat was moving rather slowly, asked the reason. She was told that it was because of the fog.

"But it is quite clear above," she persisted.

"Yes, madam," replied the officer to whom she had spoken, "but we're not going that way unless the boilers burst."

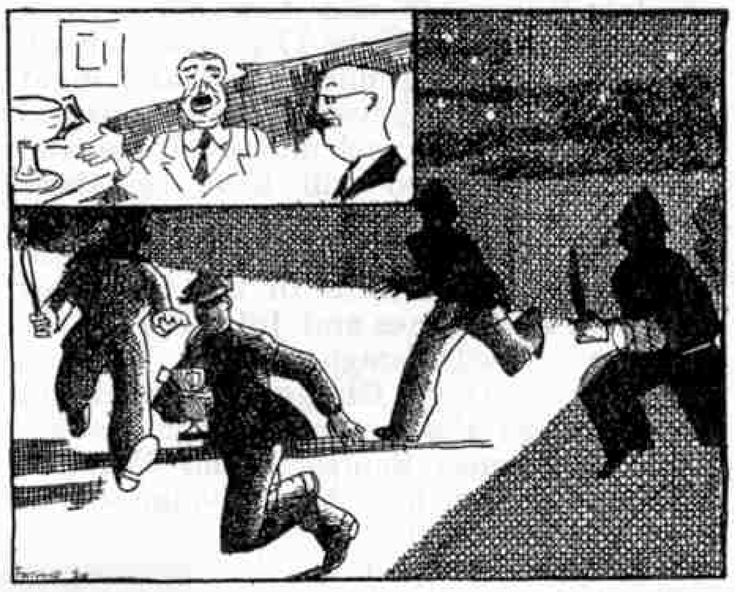
* * * *

Inspector: "Now who can tell me what are raised in wet climates?"

Jimmy: "Umbrellas, sir."

* * * *

HIS BEST



Burglar (displaying trophies): "I got this for one of my best efforts—a hundred yards race against three coppers, with ten yards start."

* * * *

Covered with grime, the motorist emerged scowling from beneath the car. His smiling friend, fresh and debonair, beamed down upon him, waving an oil can. "I've just given the cylinder a thorough oiling, old man," he said. "Thought that might help to make the old bus go."

"Cylinder be hanged," yelled the enraged one, "That was my ear."

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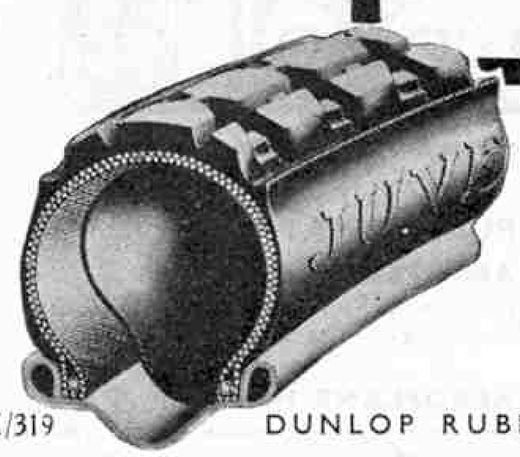

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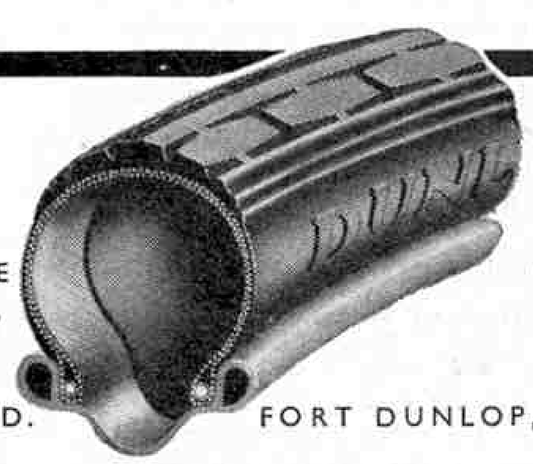

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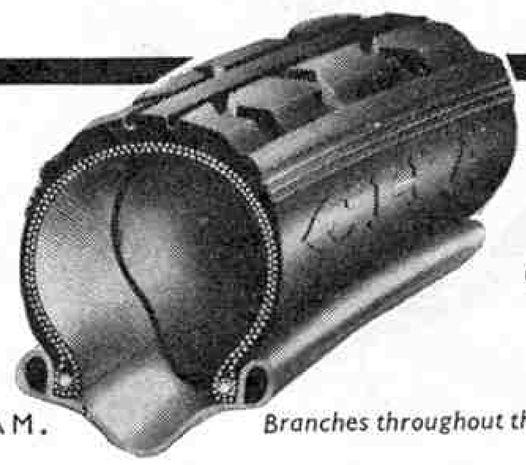

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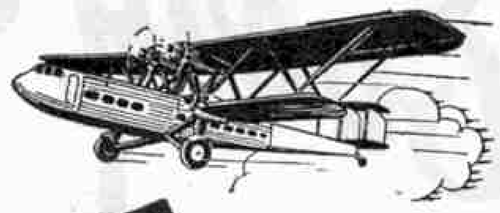
AEROPLANE CONSTRUCTOR OUTFITS



No. 2 Aeroplane Outfit. Price **12/6**

Boys! build your own model aircraft

Every boy should know how aeroplanes are designed and constructed, and should be able to recognise the different types of machines at a glance. These fine Constructor Outfits contain a range of aeroplane parts by means of which boys are able to design and build their own Aeroplanes quite easily.

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Light Biplane (No. 2 Special Aeroplane Outfit)

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Price List of Aeroplane Outfits

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No. OO Outfit	... **3/3**	No. 1 Outfit	... **7/6**
No. O Outfit	... **4/6**	No. 2 Outfit	... **12/6**

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No. 1 Special Outfit **12/6** No. 2 Special Outfit **21/–**

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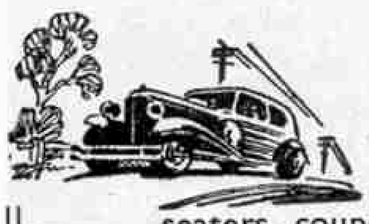
Will accommodate two models made with the No. O or No. OO Outfits. Length 27½ in. Depth 11 in. Height 6¼ in. Price **5/11**

MOTOR CAR CONSTRUCTOR OUTFITS



You will be keen to have one!

Boys, as soon as you see these fine Motor Car Constructor Outfits you will be keen to have one. The models they build are superb—sports four-seaters, coupés, speed cars and other perfect miniature reproductions, each one a beautiful model of its prototype. The motor car parts are finished in rich enamel, nickel plate and chromium.

No. 1 Motor Car Outfit. Price **10/–**

No. 1 MOTOR CAR CONSTRUCTOR OUTFIT

The motor car models that can be built with this Outfit are perfect examples of miniature automobile construction. Think of the fine fun you could have building these wonderful models, each one of which faithfully resembles its prototype.

No. 1 Outfit is supplied complete with powerful Clockwork Motor. Price **10/–**

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Larger models of a superior type can be built with No. 2 Outfit. Their handsome and realistic appearance may be judged from the model illustrated on the right.

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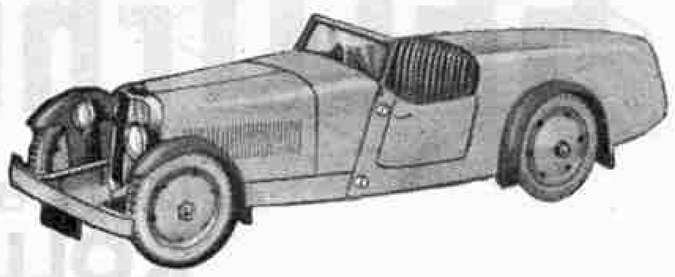
With this Lighting Set the headlamps of Motor Car models built with the No. 2 Motor Car Outfits can be electrically lighted. Price **2/6**

MOTOR CAR GARAGE

This realistic Motor Car Garage provides accommodation for any Meccano model motor car or other cars of suitable size. Inside dimensions: Height 5 in. Length 13 in. Width 7¾ in. Price **5/6**



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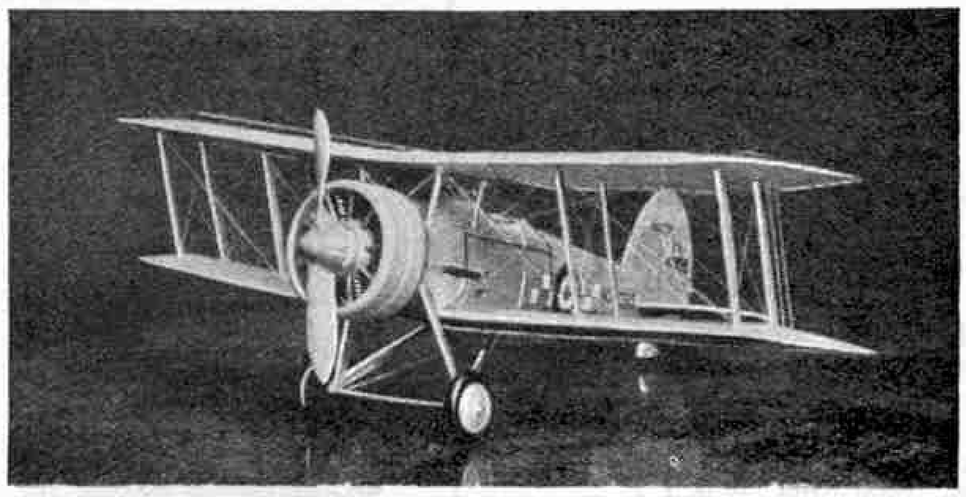
AEROMODEL No. 11



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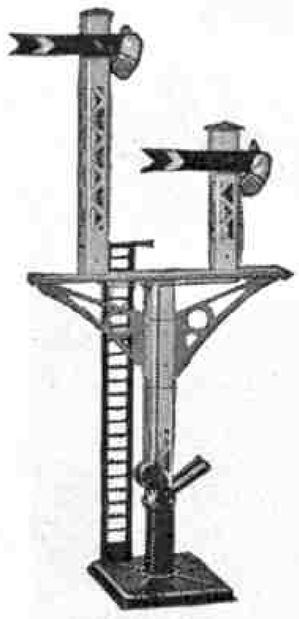

No. 2 JUNCTION SIGNAL "Home" or" Distant." Signal arms operated by levers at base. A very realistic model. Price 4/9

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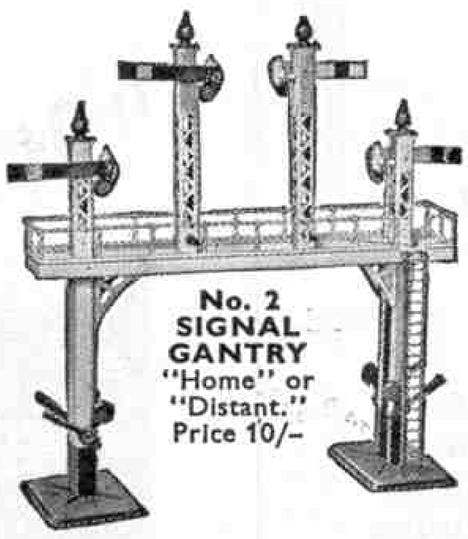
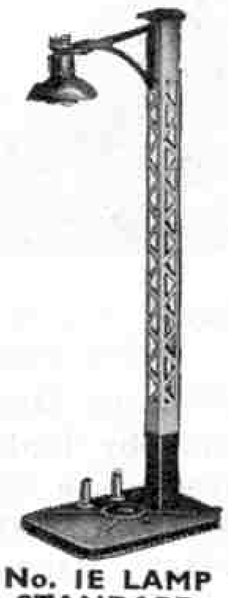
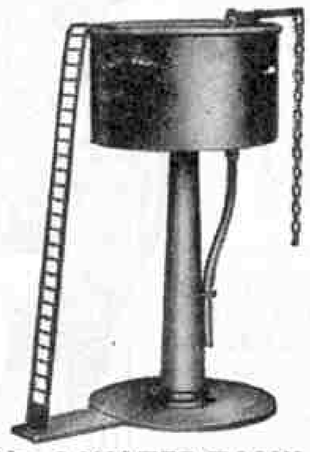
No. 2 SIGNAL CABIN Dimensions: Height 6½ in., width 3½ in., length 6½ in. Roof and back open to allow Lever Frame to be fitted inside cabin if desired. Price 3/9



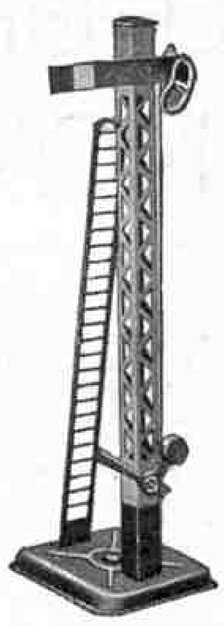
No. 2 SIGNAL GANTRY "Home" or "Distant." Price 10/-



No. IE LAMP STANDARD (Single) Price 2/11



No. 2 WATER TANK Fitted with flexible tube and valve lever. Stands 8½ in. high. Price 5/9



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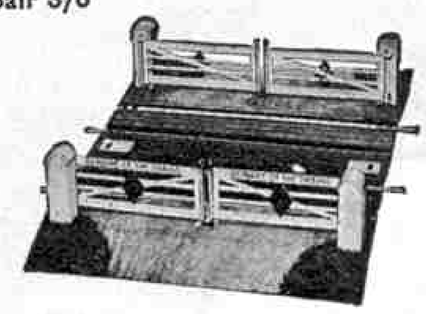
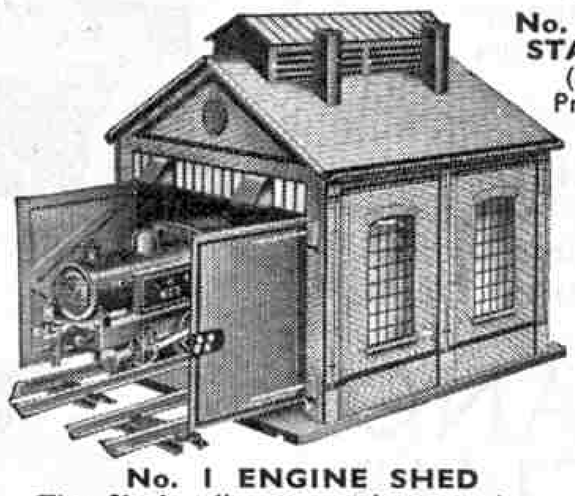
No. 1 BUFFER STOPS (Spring type). Price 1/-

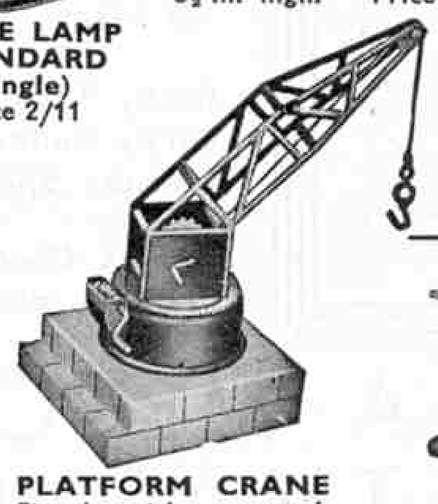


No. 2 LEVEL CROSSING Measures 13½ x 10¼ in., with two tracks of gauge O rails in position. as illustrated. Price 5/6

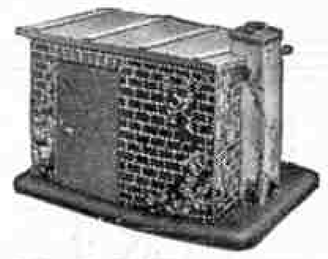
No. 1 LEVEL CROSSING Suitable for single track only. Price 2/11



No. 1 ENGINE SHED This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 8¾ in. Price 15/-



PLATFORM CRANE Fitted with a crank handle and ratchet mechanism. Price 3/11



PLATELAYER'S HUT Price 1/-

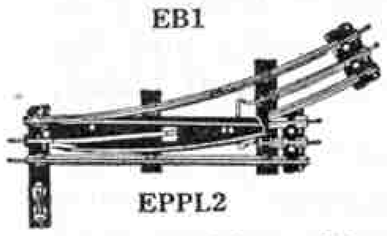
HORNBY RAILS, POINTS and CROSSINGS

GAUGE 0, 1¼". HORNBY SERIES.

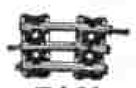
Hornby Rails, Points and Crossings are built for hard wear and for smooth running.

There is practically no limit to the number of rail formations that can be built with them. Their adaptability is well shown in the booklets "How to Plan your Hornby Railway" and "Hornby Layouts–100 Suggestions," both of which may be obtained from your dealer, price 3d., or from Meccano Ltd., Binns Road, Liverpool 13, price 4d.

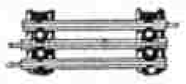
EB1



EPPL2

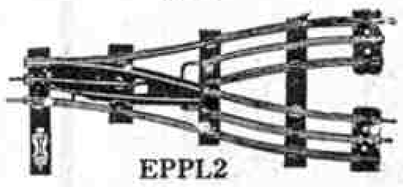


EA2½



EB½

EA2



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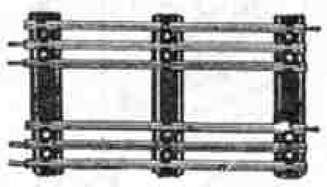
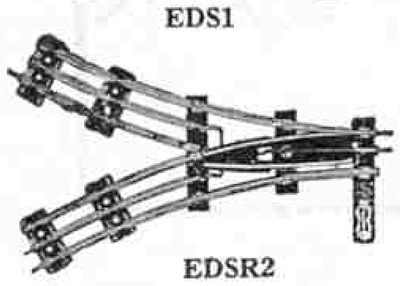


EDS1



EDSR2

A SELECTION OF RAILS, POINTS AND CROSSINGS FOR ELECTRIC TRAINS

EB1 Straight rails	per doz.	5/-
EB½ ,, half rails ...	,, ,,	4/6
EA2½ Curved quarter rails (2 ft. radius)	,, ,,	4/-
EA2 Curved rails (2 ft. radius)	,, ,,	5/-
EPPR2 Parallel points, right-hand	per pair	7/-
EPPL2 Parallel points, left-hand	per pair	7/-
These points can be used for either 1 ft. or 2 ft. radius tracks.		
ESPSR2 Right-hand points (2 ft. radius)	per pair	7/6
ESPSL2 Left-hand points (2 ft. radius)	per pair	7/6
EPR1 Right-hand points (1 ft. radius)	per pair	5/9
EPL1 Left-hand points (1 ft. radius)	per pair	5/9
EDS1 Straight rails, double track	½ doz.	8/6
EDSR2 Double symmetrical points, right-hand (2 ft. radius)	per pair	7/-
EDSL2 Double symmetrical points, left-hand (2 ft. radius)	per pair	7/-
EDSR1 Double symmetrical points, right-hand (1 ft. radius)	per pair	6/-
EDSL1 Double symmetrical points, left-hand (2 ft. radius)	per pair	6/-

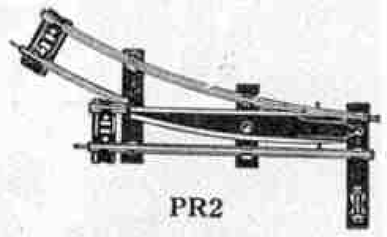
FOR CLOCKWORK TRAINS

B1 Straight rails	per doz.	3/6
A1 Curved rails	,, ,,	3/6
PR1 Right-hand points (1 ft. radius)	per pair	3/-
PL1 Left-hand points (1 ft. radius)	per pair	3/-
PR2 Right-hand points (2 ft. radius)	per pair	3/-
PL2 Left-hand points (2 ft. radius)	per pair	3/-
CA2 Acute-angle crossings (for 2 ft. radius track)	each	1/6
PPR2 Parallel points, right-hand	per pair	3/6
PPL2 Parallel points, left-hand	per pair	3/6
The above can be used for either 1 ft. or 2 ft. radius track.		
DC2 Curved rails, double track, 2 ft. radius only ...	½ doz.	6/-

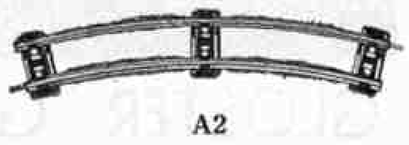
Ask your dealer for an illustrated price list.

MECCANO LIMITED, Binns Road, Liverpool 13

B1

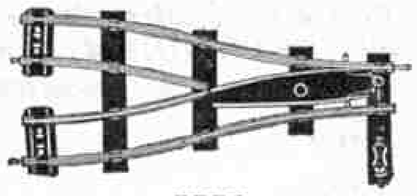


PR2

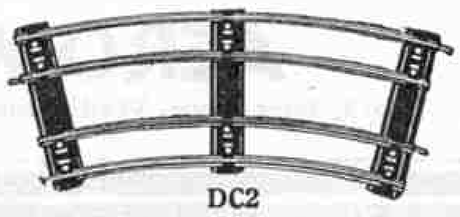


A2

CA2



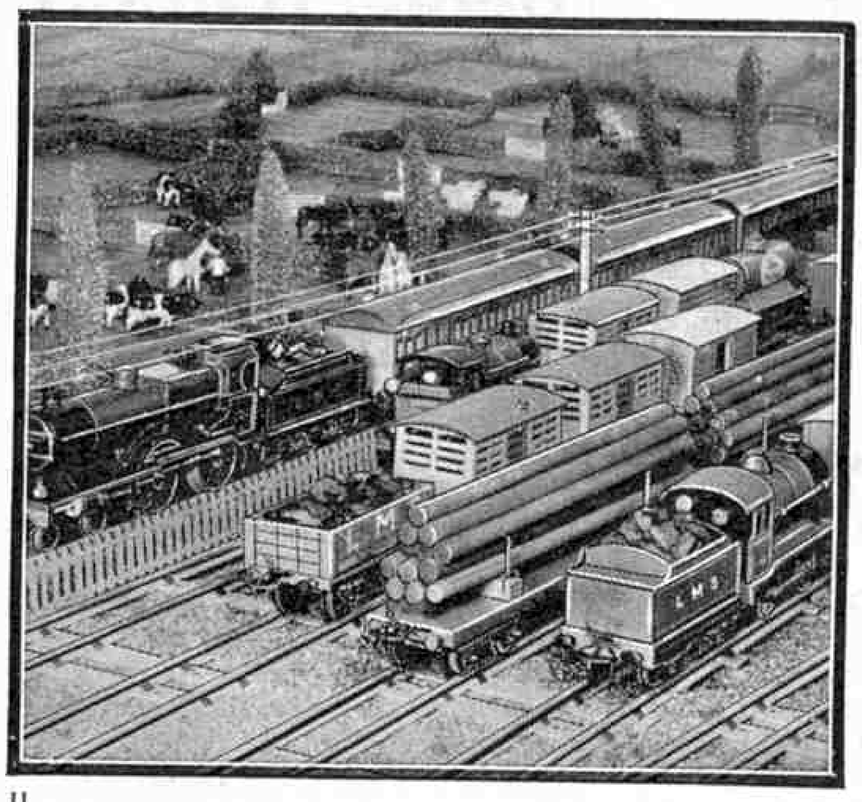
PPR2



DC2

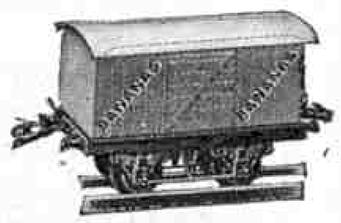
HORNBY ROLLING STOCK

GAUGE O

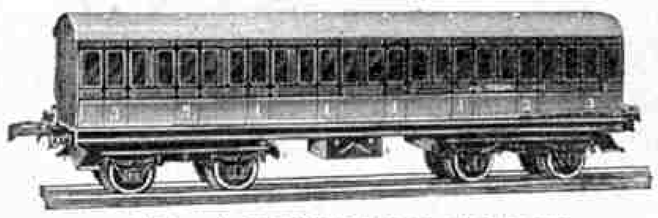


The Hornby Series includes a splendid range of realistic Rolling Stock. Each item is fitted with patented and exclusive automatic couplings, a special feature that places it in a class entirely of its own. There are Pullman Cars, Passenger Coaches, Guards' Vans, Tipping Wagons, Lumber Wagons, and many other types, all beautifully finished.

An attractive selection of Hornby Rolling Stock is illustrated and described on this page. Ask your dealer for a complete price list.

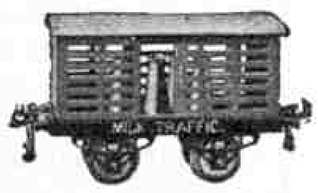


No. 1 BANANA VAN
An attractive model, finished in yellow and red. Price **2/9**

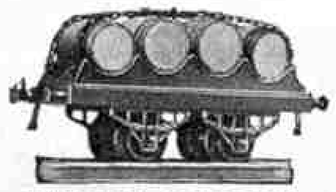


***No. 2 PASSENGER COACH**
Suitable for 2-ft. radius rails only. First-third, or Brake-third. Price **7/6**

MEAT VAN
This is a very realistic model. Available lettered L.M.S. only. Price **1/9**



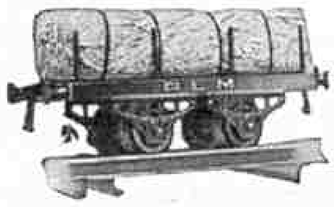
No. 1 MILK TRAFFIC VAN
Fitted with sliding doors. Complete with milk cans. Price **2/11**



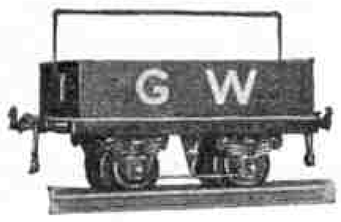
BARREL WAGON
This is another interesting model of a type of wagon used in France and other European countries. Price **2/6**

No. 1 TIMBER WAGON
Beautifully enamelled in yellow and red. Price **1/6**

No. 1 SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd." Price **2/-**

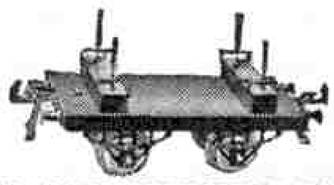


FIBRE WAGON
This is an interesting model of a type of wagon used in France and other European countries. Price **1/3**

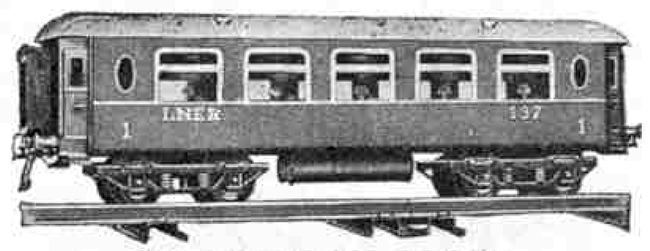


***OPEN WAGON "B"**
Similar to Hornby Wagon No. 1 but fitted with centre tarpaulin supporting rail. Price **2/-**

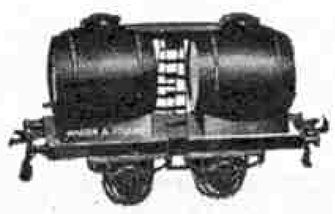
***GUNPOWDER VAN**
Finished in red. With opening doors. Price **2/9**



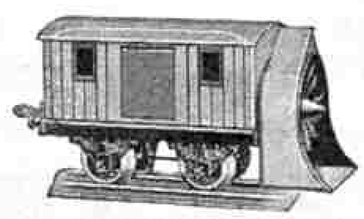
No.1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Price **1/6**



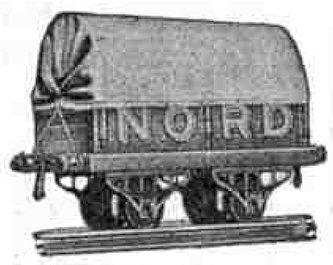
No. 2 SALOON COACH
Realistic in design and beautifully finished. Two types are available: L.N.E.R. (as illustrated) enamelled brown, and L.M.S. enamelled maroon. Suitable for 2-ft. radius rails only. Price **9/6**



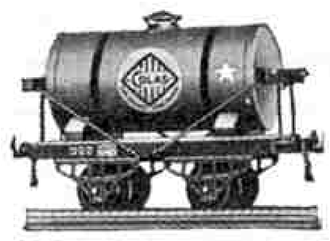
WINE WAGON DOUBLE BARREL
An attractive model artistically enamelled in red and green. Price **4/6**



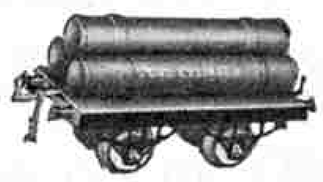
SNOW PLOUGH
With revolving plough. Price **3/9**



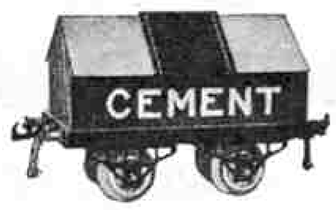
COVERED WAGON (French Type)
This wagon is fitted with frame and sheet. Lettered "Nord." Price **2/6**



BITUMEN TANK WAGON "COLAS"
Finished in blue. Price **3/6**



GAS CYLINDER WAGON
Finished in red, lettered gold. Price **1/11**

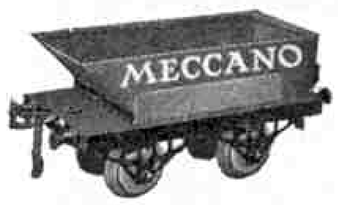


CEMENT WAGON
The door at the top opens. Finished in bright red. Price **2/6**

No. 1 PETROL TANK WAGON "B.P."
Finished in yellow. Price **2/-**

OIL TANK WAGON "MOBILOIL"
Finished in battleship grey. Price **2/-**

COAL WAGON
This is similar to Hornby Wagon No. 1. It is fitted with embossed representation of coal. Price **2/3**



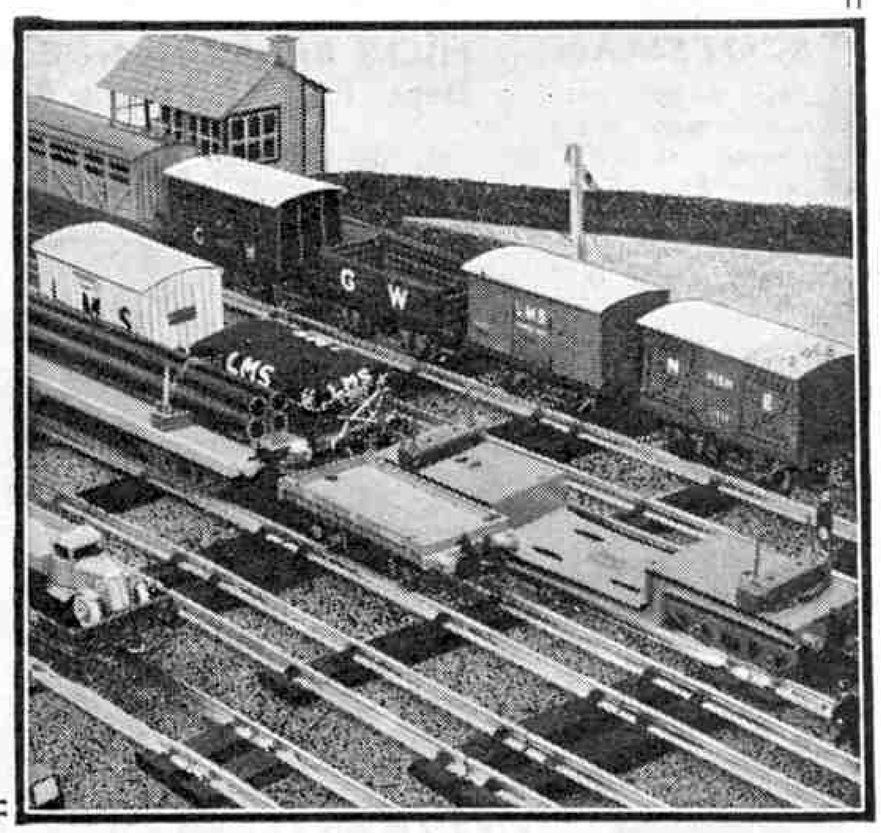
No. 1 ROTARY TIPPING WAGON
Finished in orange. Price **2/6**

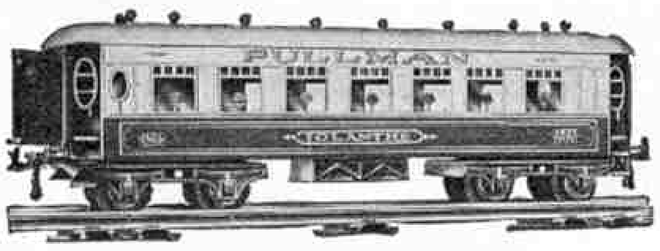
TROLLEY WAGON
Finished in brown and blue. Suitable for 2-ft. radius rails only. Price **3/9**

***REFRIGERATOR VAN**
Beautifully enamelled. Fitted with opening doors. Price **2/9**

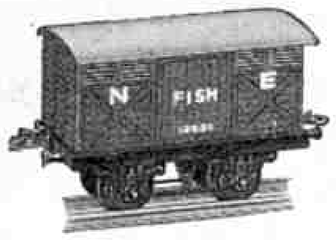
CHOCOLATE VAN "CADBURY'S"
This van is beautifully enamelled in blue with white roof. Price **2/9**

No. 2 TIMBER WAGON
Beautifully enamelled in green and red. Suitable for 2-ft. radius rails only. Price **2/6**

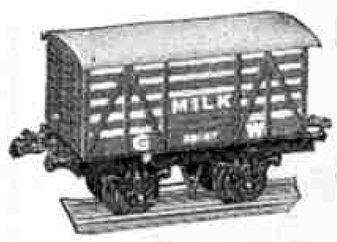




No. 2 SPECIAL PULLMAN COACH
As supplied with No. 2 Special and No. 3 Pullman Train Sets. This splendid coach is perfect in detail and finish. Suitable for 2-ft. radius rails only. Price **13/-**



FISH VAN
This is a distinctive model. Available lettered N.E. only. Price **1/9**



No. 0 MILK TRAFFIC VAN
An attractive model. Available lettered G.W. only. Price **1/9**

In L.M.S., L.N.E.R., G.W. or S.R. lettering.

Manufactured by MECCANO LTD., BINNS ROAD, LIVERPOOL 13

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THE unique trigger release (like a rifle) under the baseboard of the BESSA allows you to make the exposure so smoothly that any shakiness or shutter vibration is avoided, and you can hold the camera at eye-level and obtain natural perspective.
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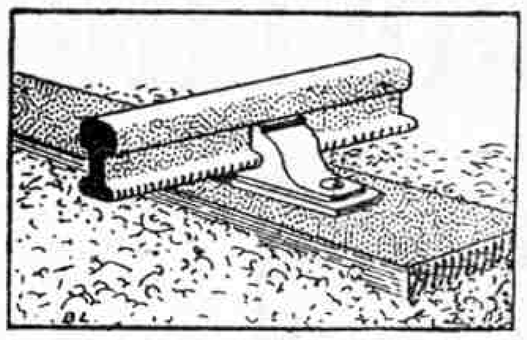
This perfect true-to-scale model of the famous L.N.E.R. engine "Flying Scotsman" is priced at £22/5/–. Electric 6-8 volts. Gauge O.



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We supply the most economical Good Quality permanent way components obtainable. Here is the list:

Solid drawn Steel Rails, of exact section, in 3 ft. lengths, with clean cut, squared ends, 2d. per length, 1s. 8d. per doz. lengths.
FISHPLATE. Made of spring brass ... ... **3s. 6d.** per 100
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KEYLESS CHAIRS. Die-cast. (Uncoloured) ... **1s. 6d.** per 100
SLEEPERS. 3 in. long ... ... **2s.** per 100
LONGITUDINAL BATTENS, 36 in. long, treated with compound ... ... **2s.** doz. lengths
HOLDING DOWN SPIKES ... ... **1d.** per 100
Point Parts for Steel Track, Gauge O, 3 ft. radius turnout, non-electric, without lever, packed in cardboard box. A diagram showing method of assembling the points is included. Price **6s. 6d.** Postage **6d.**
Centre rail and accessories for converting to electric.
Price **1s. 8d.** extra.

ADDITIONS FOR ELECTRIC TRACK

Centre Rail, drawn brass, in 3 ft. lengths ... ... **4s.** per doz.
Centre Rail Chairs, special pattern, for raised or "all level" track (specify which) ... ... **3s. 4d.** per 100
Centre Rail Fishplates, in brass ... ... **4s. 3d.** per 100

For full details of Track and all Model Railway Accessories get A.17 Model Railway Catalogue, 6d. (post free).

Free Folders F.B.17, "LILLIPUTIAN POWER" (Gauge "O" Railways) and TT.17, the TWIN TRAIN Folder (Gauge "OO" Railways).

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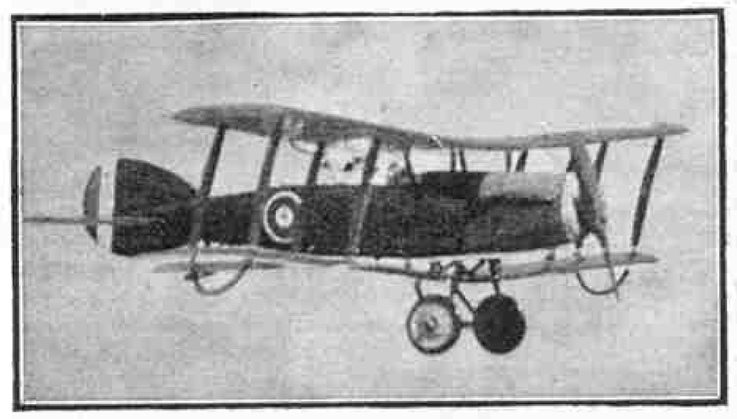
NEW MODELS for YOUR COLLECTION!

WARTIME BRISTOL "FIGHTER"

Constructional Set, price **2/6**



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The FAIREY "HENDON" NIGHT BOMBER
Constructional Set 12/6

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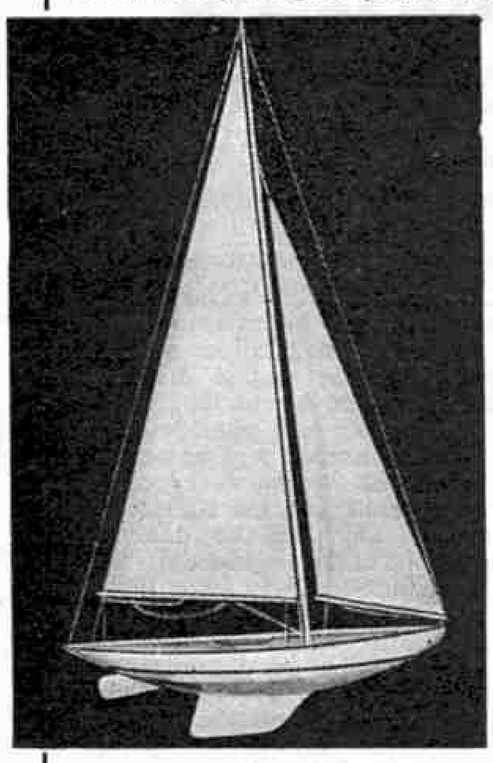

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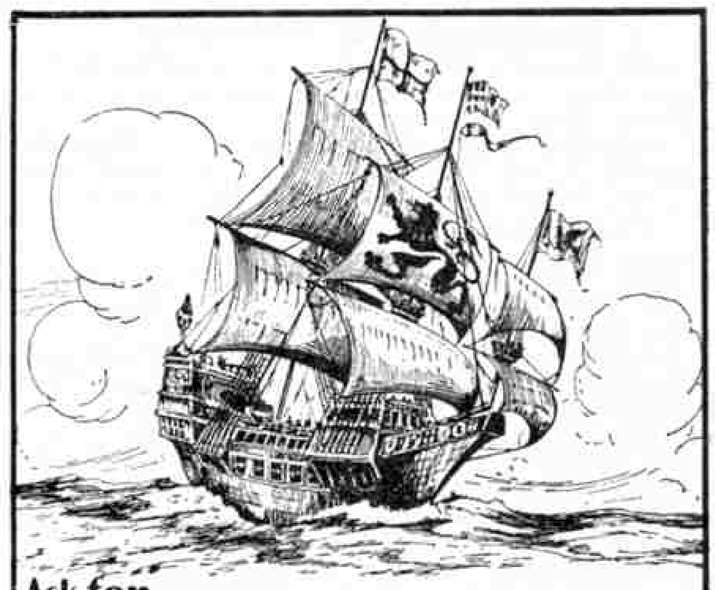

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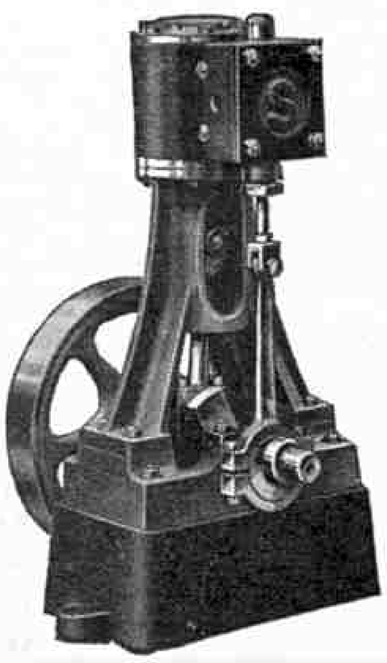

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Sale. Two Pairs Boxing Gloves, cost 15/–. Warneford Nipper, unused, cost 2/6. Two large, three small Goldfish Bowls, cost 6/6. 28 "Hobbies Weekly." 28 Hobbies Designs. Offers?—Choice, Oakfields, Knebworth.

Sale. "M.M.'s," Feb. 1929–Oct. 1935 (except Oct. 1930). Lot 12/6.—Childs, Holly Lodge, Roundwood Lane, Harpenden, Herts.

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Pathe 9.5 mm. Motocamera, good condition, £3.—Early, Chyvadna, Preston, Paignton.

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Sale. 36 "M.M.'s," 1925-1927, 5/–, carriage free.—42, The Triangle, Timperley, Cheshire.

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Sale. 50 "Meccano Magazines" from January 1928 (1930-1-2 complete), 11/– lot. Also 55 Southern Railway Mags. from August 1930, 9/– lot. Post free.—Stone, 13, Pine Walk, Surbiton, Surrey.

Sale of Hornby Rolling Stock, etc. List on application to—Jones, Oak Lea, Washway Road, Sale, Cheshire.

Stamp Advertisements continued from p. 490

600 BRITISH COLONIALS on approval. Pick at ½d. each.—Sanders, 90, Newlands Avenue, Southampton.

40 GOOD STAMPS FREE. Request Approvals. Postage please.—Twaits, 81, Rosendale Rd., London, S.E.21

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WINDSOR STAMP CO.
(M.M. Dept.), 59, Lee Road, Blackheath, S.E.3.

This Month's Special Articles

	Page
Air News	444
Anderton Canal Lift	442
Art of the Maori Carvers	435
Belfast to Liverpool by Air Liner	448
Cableway Drag-line Excavators	456
Competition Corner	487
Europe's Largest Electric Generator	430
Fireside Fun	492
Flying Boat Test Pilot at Work	432
Footplate Trip on a Southern Flyer	440
From Our Readers	466
Guild Pages	478–9
Hornby Railway Company Pages	480–485
How Great Bridges Are Built	434
How Seamless Steel Tubes are Made	446
In Search of New Models	470
L.N.E.R. "*Green Arrow*" Locomotive	452
Model-Building Contest	476
Model-Building Contest Results	477
Nature at Work and Play	436
New Outfit Models	474
Of General Interest	462
Railway News	450
Road and Track	438
R.A.F. Motor Lifeboat's Record Run	443
Seaside Photography	488
Shipping News	454
Something to Think About	486
Stamp Collecting	489
Stamp Gossip	491
Steam Tramway Systems	464
Suggestions Section	472
Sussex Iron Industry	468
Time by Telephone	458
Veteran Forth Paddle Steamer	453

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MECCANO MAGAZINE

Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICE:—
LIVERPOOL 13, ENGLAND.

Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/– for six issues and 8/– for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/–. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Advertisers are asked to note that private advertisements of goods manufactured by Meccano Limited cannot be accepted.

Small Advertisements. 1/6 per line (average seven words to the line), or 16/– per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

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Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/2 per copy (postage extra), and the subscription rates 8/– for six months and 16/– for 12 months (post free); Canada, where the price is 10c. per copy, and the subscription rates 65c. for six months, and $1.25 for 12 months (post paid).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the United Kingdom and Northern Ireland. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

CANADA: Meccano Ltd., 187-189, Church St., Toronto.
UNITED STATES: Meccano Co. of America Inc., New Haven, Conn., Meccano Co. of America Inc., 200, Fifth Av., New York.
AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND: Models Limited, Third Floor, Paykel's Buildings, 9, Anzac Avenue (P.O. Box 129), Auckland, C.1
SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.
INDIA: Karachi: Daryanamal and Bros., Elphinstone Street. Bombay: Bombay Sports Depot, Dhobi Talao. Calcutta: Bombay Sports Depot, 2, Lindsay Street.

The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

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Sign and hand this voucher to your dealer at the time of purchase. .....

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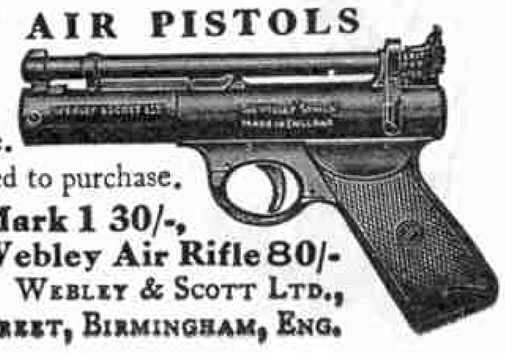

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B Meccano Outfit

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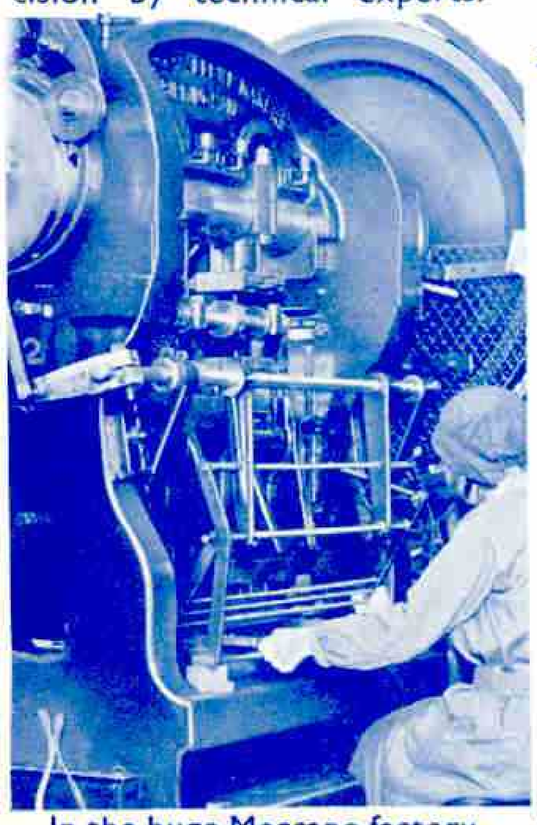

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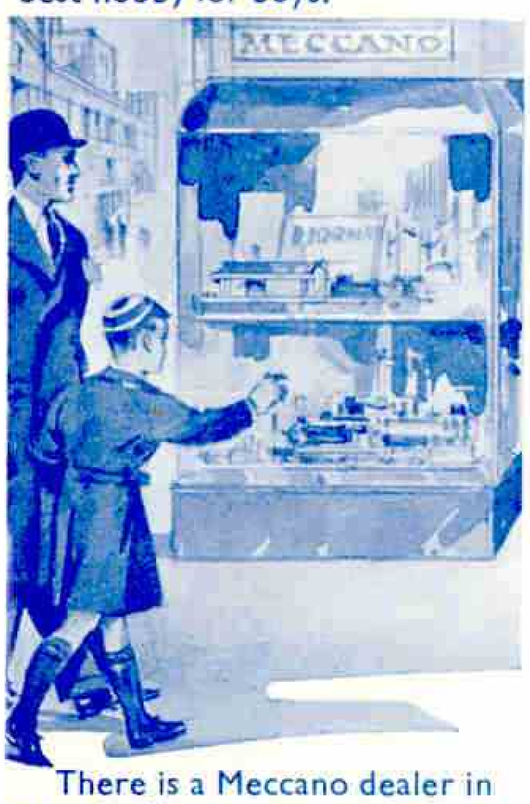

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C	,,	... ,,	10/–	Hw	,, (Cabinet)	... ,,	97/6
D	,,	... ,,	15/–	K	,, (Carton)	... ,,	132/6
E	,,	... ,,	20/–	Kw	,, (Cabinet)	... ,,	157/6
F	,,	... ,,	30/–	L	,, (,,)	... ,,	400/–

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Ea	,,	E	,, ,,	F	... ...	... ,,	11/–
Fa	,,	F	,, ,,	G	... ...	... ,,	26/6
Ga	,,	G	,, ,,	H	... ...	... ,,	17/6
Ha	,,	H	,, ,,	K	... ...	... ,,	60/–
Ka	,,	K	,, ,,	L	... ...	... ,,	225/–

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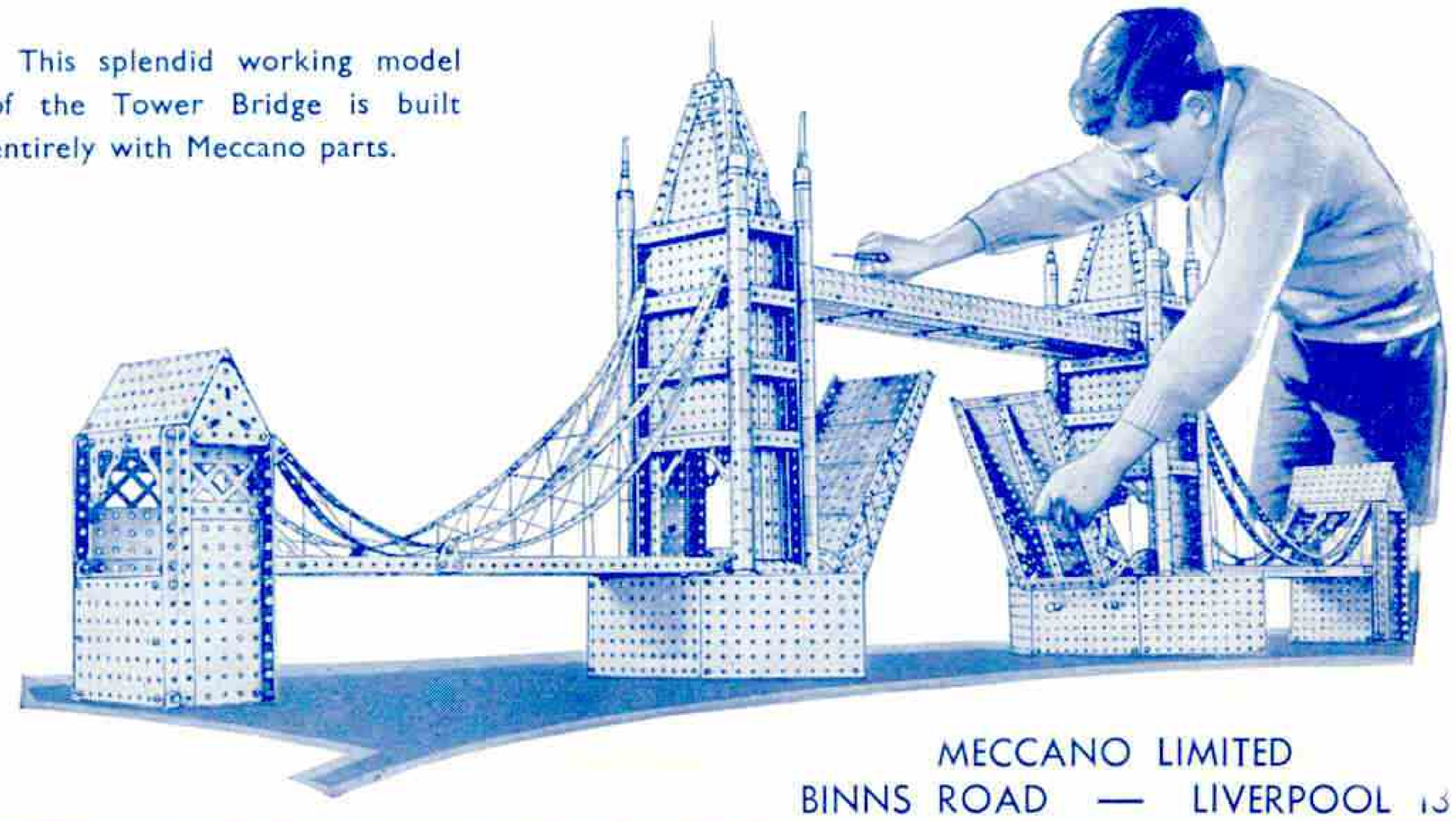

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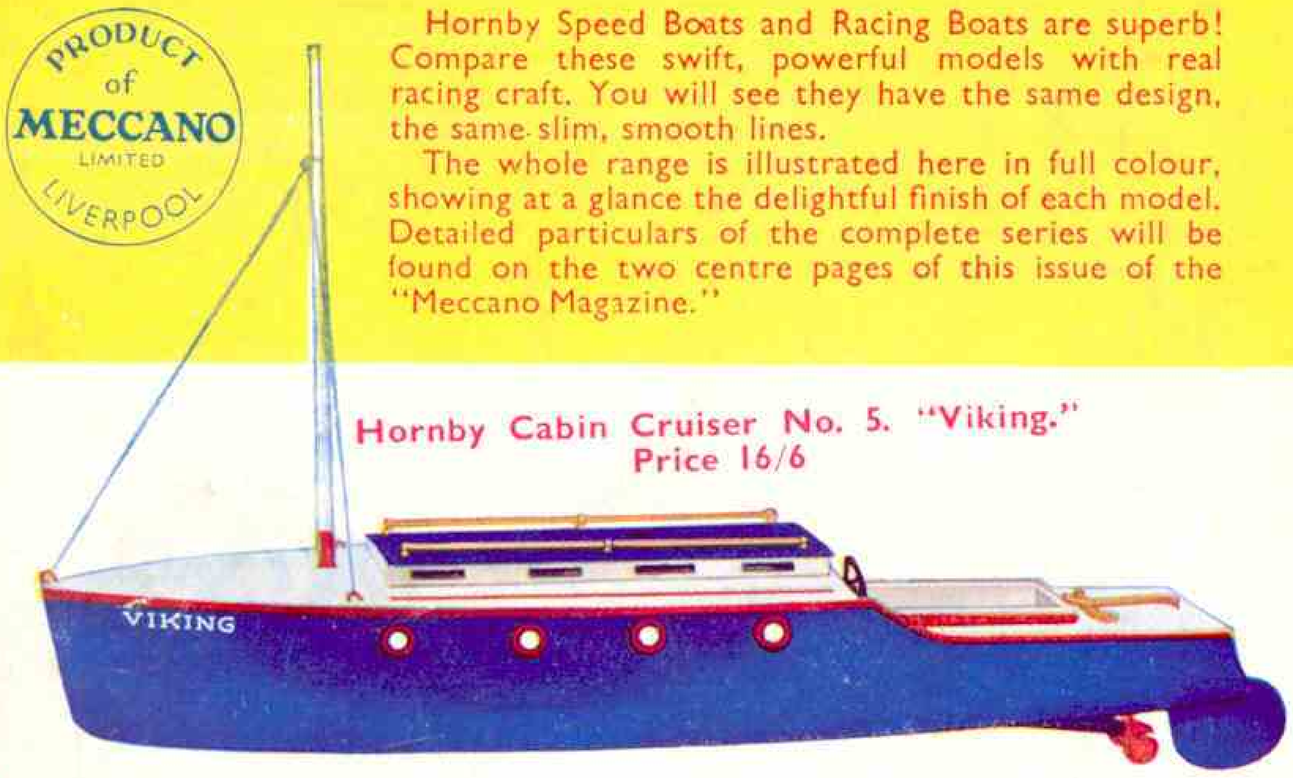
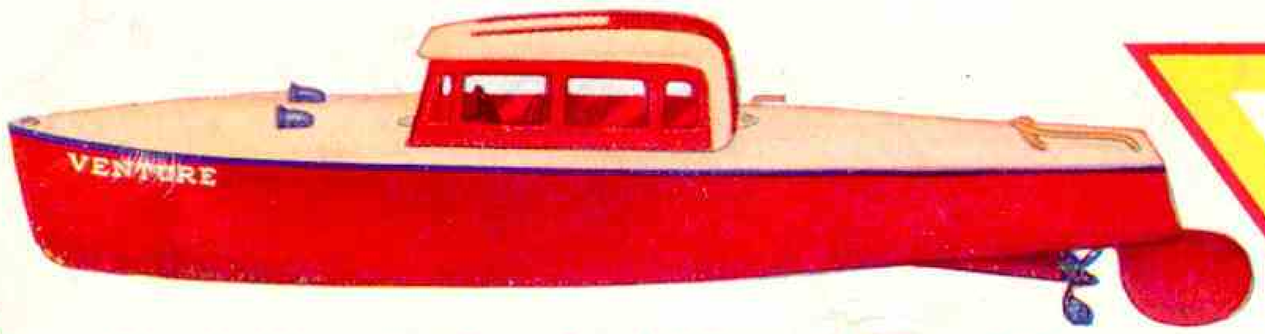
The whole range is illustrated here in full colour, showing at a glance the delightful finish of each model. Detailed particulars of the complete series will be found on the two centre pages of this issue of the "Meccano Magazine."

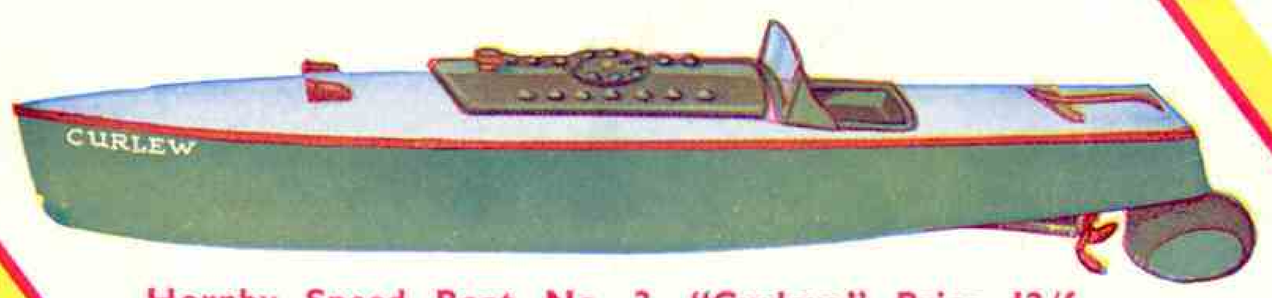
HORNBY SPEED BOATS



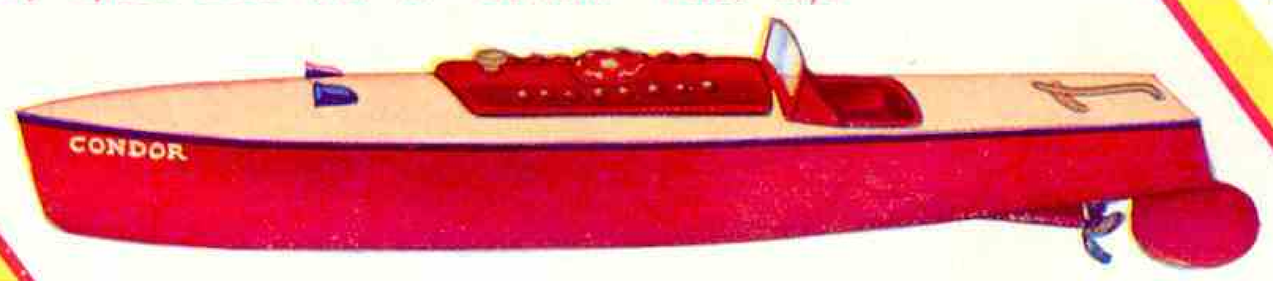
Hornby Cabin Cruiser No. 5. "Viking." Price 16/6



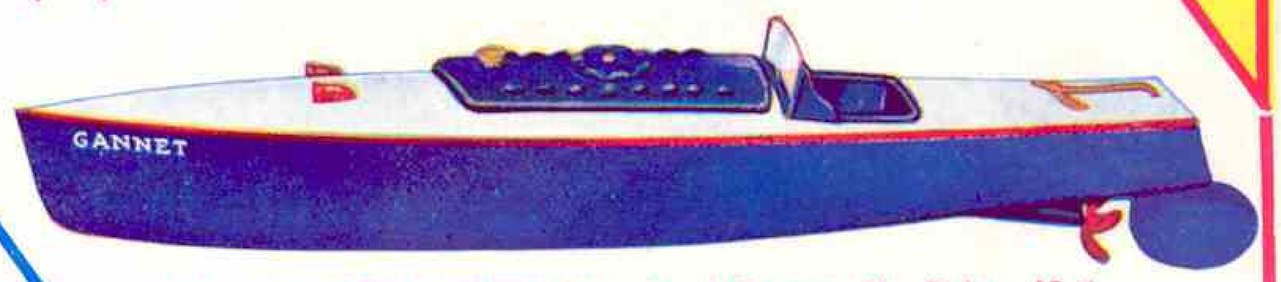
Hornby Limousine Boat No. 4. "Venture." Price 15/6



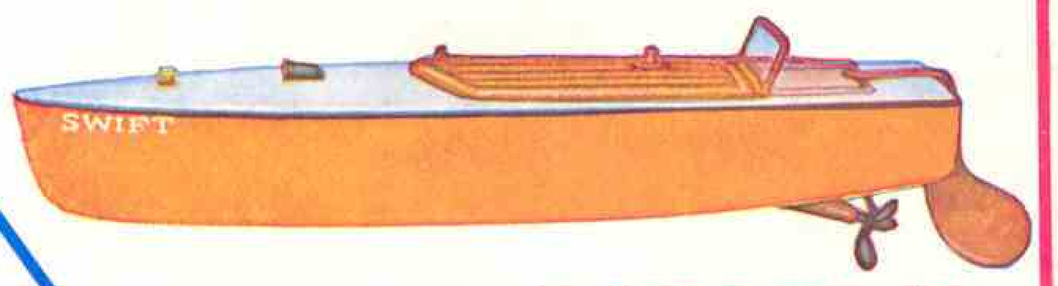
Hornby Speed Boat No. 3. "Curlew." Price 12/6



Hornby Speed Boat No. 3. "Condor." Price 12/6



Hornby Speed Boat No. 3. "Gannet." Price 12/6



Hornby Speed Boat No. 2. "Swift." Price 7/6

Hornby Speed Boat No. 1. "Hawk." Price 2/11

HORNBY

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Pennants for Hornby Speed Boats Nos. 3 and 4 may be purchased separately. They add the final touch of realism to these boats Price 2d. each.

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Join the Hornby Speed Boat Club

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Hornby Racing Boat No. 2. "Racer II." Price 8/6

Hornby Racing Boat No. 3. "Racer III." Price 14/6

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